

SINAMICS G150

Drive converter cabinet units



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Overview



SINAMICS G150 drive converter cabinet units, versions A and C

With its SINAMICS G150 drive converter cabinet units, Siemens is offering a drive system on which all line-side and motor-side components as well as the Power Module are integrated extremely compactly into a specially designed cabinet enclosure. This approach minimizes the effort and expense required to configure and install them.

SINAMICS G150 has been specially tuned to the requirements of drives with quadratic and constant load characteristics, with medium performance requirements and without regenerative feedback.

The control accuracy of the sensorless Vector Control is suitable for most applications, and additional actual speed value encoders are therefore superfluous.

However, the SINAMICS G150 converters are optionally available with an encoder evaluator in order to handle applications that require an encoder for plant-specific reasons.

SINAMICS G150 drive converter cabinet units offer an economic drive solution that can be matched to customers' specific requirements by adding from the wide range of available components and options.

There are two versions of the drive converter cabinet units:

■ Version A

All available line connection components, such as the main switch, circuit-breakers, line contactor, line fuses, line filter, motor-side components, and additional monitoring devices, can be installed as required. This version is also available with power units connected in parallel.

■ Version C

This offers an extremely space-optimized structure without line-side components. This particularly slimline version can be used, for example, when line connection components are accommodated in a central low-voltage distribution panel (MCC) on the plantside.

The SINAMICS G150 drive converter cabinet units are available for the following voltages and power ranges:

Line voltage	Power range for single circuit (versions A and C)	Power range for parallel circuit (version A)
380 ... 480 V 3 AC	110 ... 560 kW	630 ... 900 kW
500 ... 600 V 3 AC	110 ... 560 kW	630 ... 1000 kW
660 ... 690 V 3 AC	75 ... 800 kW	1000 ... 1500 kW

Degrees of protection are IP20 (standard), and, as an option, IP21, IP23, IP43 and IP54.

Global use

SINAMICS G150 drive converter cabinet units are manufactured in compliance with relevant international standards and regulations, and are therefore suitable for global use (→ Technical specifications).

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75 kW to 1500 kW

Benefits

- Particularly quiet and compact converters due to the use of state-of-the-art IGBT power semiconductors and an innovative cooling concept.
- Individual modules and power components can be replaced quickly and easily, which ensures a higher level of plant availability. The design of replaceable components is based on the principle that they must be quick and easy to change. In addition, the "SparesOnWeb" Internet tool makes it easy to view the spare parts that are available for the system components ordered.
- Can be easily integrated in automation solutions due to a communications interface supplied as standard and various analog and digital interfaces.
- Easy commissioning and parameterization using interactive menus on the user-friendly AOP30 Advanced Operator Panel with graphical LCD and plain-text display, or from a PC using the STARTER commissioning tool (→ Tools and configuration)
- Preset software functions make it easier to tailor the converter to the individual plant. For example, the key functions for controlling pumps are stored as a preprogrammed macro in the drive.
- They have been designed as "zoned" units and therefore offer the highest possible standard of operational reliability. EMC measures have been rigorously implemented. With the help of simulated conditions, partitions have been designed to act as air guides and heat dissipation units.
- Special measures used in the construction of the cabinets ensure that they remain mechanically durable throughout their entire life cycle. All components, from individual parts to the ready-to-connect cabinet, undergo rigorous testing throughout the entire production process. This guarantees a high level of functional reliability during installation and commissioning, as well as in operation.

Application

Variable-speed drives are advantageous for all applications that involve moving, conveying, pumping or compressing solids, liquids or gases.

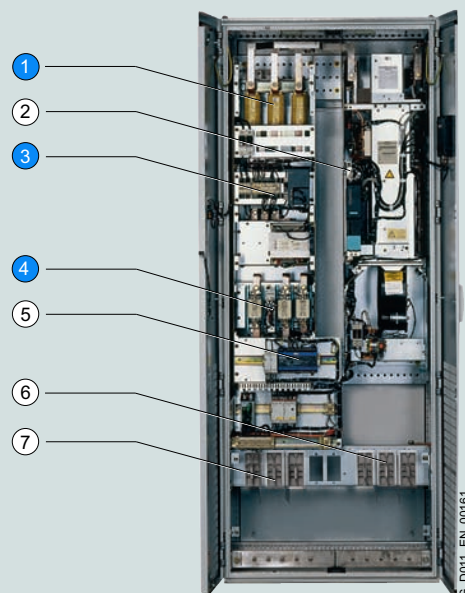
This means the following applications in particular:

- Pumps and fans
- Compressors
- Extruders and mixers
- Mills

Design

SINAMICS G150 drive converter cabinet units are characterized by their compact, modular, and service-friendly design.

A wide range of options is available depending on the cabinet version which permit optimum adaptation of the drive system to the respective requirements (→ Options).



- ① Line reactor (< 500 kW standard)
- ② PROFIBUS connection
- ③ Line contactor
- ④ Main control switch with fuses
- ⑤ Customer's terminal block
- ⑥ Motor connection
- ⑦ Line connection

- Standard version
- Options

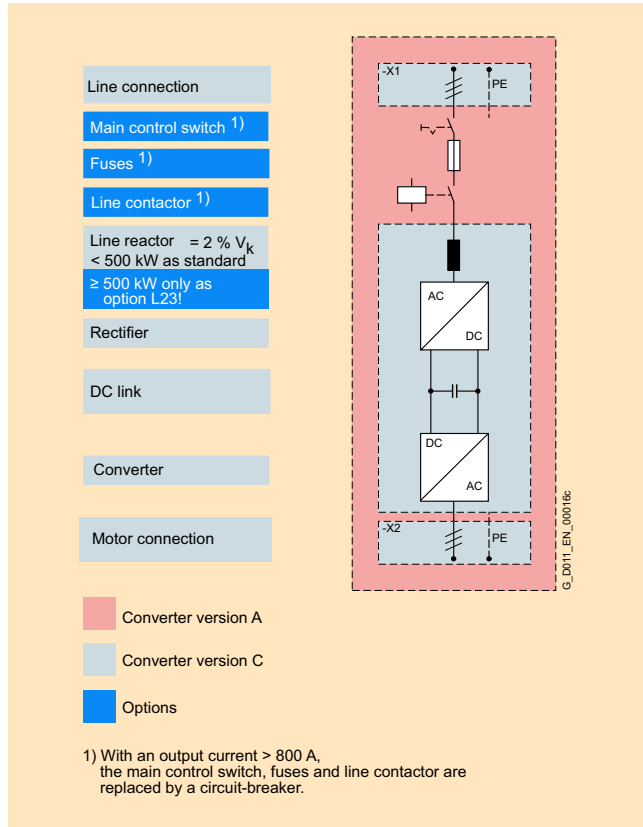
Example of design of a SINAMICS G150 drive converter cabinet unit, version A

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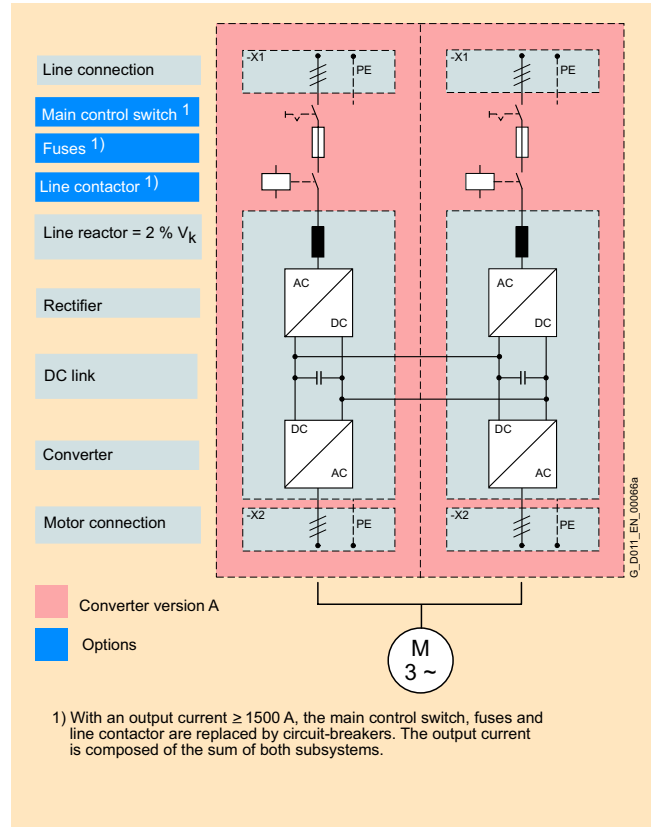
Drive converter cabinet units

75 kW to 1500 kW

Design (continued)



Basic design of a SINAMICS G150 drive converter cabinet unit with a number of version-specific options



Basic design of a SINAMICS G150 drive converter cabinet unit with parallel circuit in order to increase output, with a number of version-specific options

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Function

AOP30 Advanced Operator Panel



An AOP30 Advanced Operator Panel is located in the cabinet door of the converter for operation, monitoring and commissioning tasks.

The AOP30's two-stage safety concept prevents unintentional or unauthorized changes to settings. Operation of the drive from the operator panel can be disabled by a password ensuring that only parameter values and process variables can be displayed on the panel. The OFF key is factory-set to active but can also be deactivated by the customer. A password can be used to prevent the unauthorized modification of converter parameters.

The user is guided through the screens for commissioning the drive by the menu-driven display. Only 6 motor parameters (which can be found on the motor rating plate) have to be entered when the AOP30 is commissioned for the first time. The control is then optimized automatically to fine-tune the converter to the motor.

English, French, German, Italian, Spanish and **Chinese** are stored on the CU320 Control Unit's CompactFlash card as operator panel languages. The desired language must be downloaded to the AOP30 prior to commissioning. **Russian, Polish** and **Czech** are available in addition to these standard panel languages. These can be downloaded free of charge from the Internet under the following link:

<http://support.automation.siemens.com/>

The following pictures show examples of plain-text displays in various operating phases.

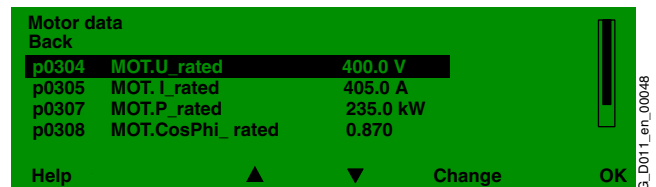
First commissioning is carried out using the operator panel.



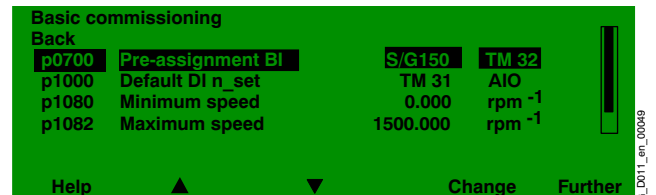
Only 6 motor parameters have to be entered:

power, speed, current, cos phi, voltage and frequency of the motor.

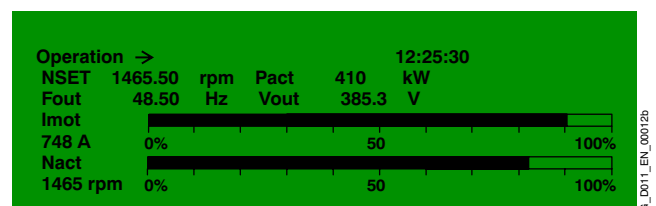
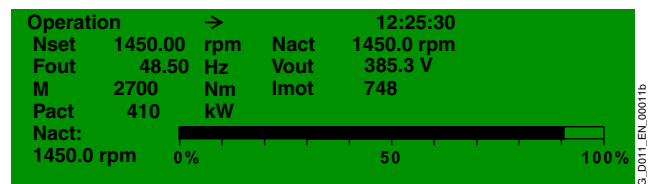
This information can be found on the motor rating plate and is entered into the screens on the display by following a short, menu-driven procedure. The cooling method of the motor must be entered in addition.



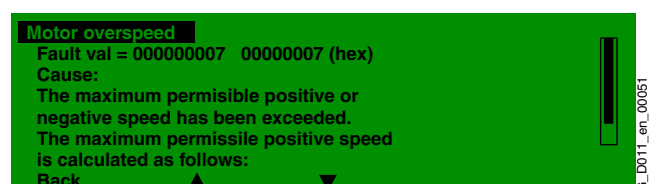
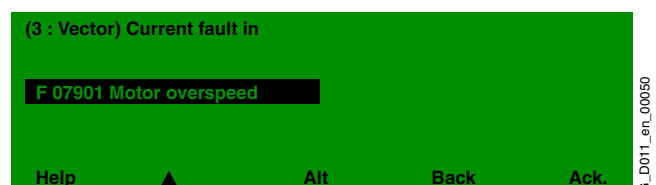
The next screen contains the parameter values that are used to automatically optimize the control.



During **operation**, current data are output on the display as absolute values such as setpoint and actual values, or it is possible to parameterize up to 3 process variables as a quasi-analog bar display.



Any **alarms** which occur are signaled by flashing of the yellow "ALARM" LED, **faults** by lighting up of the red "FAULT" LED. There is also an indication of the cause displayed in plain text on the display's status line.



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Function (continued)

Communication with higher-level control and customer's terminal block

A communications interface on the CU320 Control Unit and the TM31 Terminal Module and TB30 Terminal Board are provided as standard for use as the customer interface.

You can use this customer's terminal block to connect the system to the higher-level controller using analog and digital signals, or to connect additional units.

To simplify configuration and commissioning of the drive, the TM31 Terminal Module can be preset to a variety of factory default settings.

Open-loop and closed-loop control functions

The converter control contains a high-quality sensorless Vector Control with speed and current controls as well as motor and converter protection.

Software and protection functions

The software functions available as standard are described below:

Software and protection functions	
Setpoint input	The setpoint can be defined internally and externally, internally as fixed or motorized potentiometer or jog setpoints, externally via the communications interface or an analog input on the customer's terminal block. The internal fixed setpoint and the motorized potentiometer setpoint can be switched over or adjusted using control commands via all interfaces.
Motor identification	Automatic motor identification permits fast and simple commissioning and optimization of the drive control.
Ramp-function generator	A user-friendly ramp-function generator with separately adjustable ramp-up and ramp-down times, together with adjustable rounding times in the lower and upper speed ranges, improves the control response and therefore prevents mechanical overloading of the drive train. The ramp-down ramps can be parameterized separately for emergency stop.
V_{dc max} controller	The V _{dc max} controller automatically prevents overvoltages in the DC link if the set ramp-down ramp is too short, for example. This may also extend the set ramp-down time.
Kinetic buffering (KIP)	Line voltage failures are bridged to the extent permitted by the kinetic energy of the drive train. The speed drops depending on the moment of inertia and load torque. The current speed setpoint is resumed when the line voltage returns.
Automatic restart ¹⁾	The automatic restart switches the drive on again when the power is restored after a power failure, and ramps up to the current speed setpoint.
Flying restart ¹⁾	The flying restart permits bumpless connection of the converter to a rotating motor.
Technology controller	The "technology controller's" function module allows simple control functions to be implemented, e.g. level control or volumetric flow control. The technology controller is designed as a PID controller, whereby the differentiator can be switched to the control deviation channel or the actual value channel (factory setting). The P, I, and D components can be set separately.
Free function blocks	Using the freely programmable function blocks, it is easy to implement logic and arithmetic functions for controlling the SINAMICS G150 unit. The blocks can be programmed by means of an operator panel or the STARTER commissioning tool.
Drive Control Chart (DCC)	Drive Control Chart (DCC) is an additional tool for the easy configuration of process-oriented functions for the SINAMICS G150. The block library contains a large selection of control, arithmetic and logic blocks as well as extensive open-loop and closed-loop control functions. The user-friendly DCC editor enables easy graphical configuration and a clear representation of control loop structures as well as a high degree of reusability of existing diagrams. DCC is an add-on to the STARTER commissioning tool (→ Tools and configuration).
Pt detection for motor protection	The motor temperature is calculated in a motor model stored in the converter software, taking into account the current speed and load. More exact sensing of the temperature, also taking into account the influence of the ambient temperature, is possible by means of direct temperature sensing using KTY84 sensors in the motor winding.
Evaluation of motor temperature	Motor protection by evaluating a KTY84 or PTC temperature sensor. When a KTY84 sensor is connected, the limit values can be set for alarm or shutdown. When connecting a PTC thermistor, the reaction following triggering of it (alarm or shutdown) can be defined.
Motor blocking protection	A blocked motor is recognized and protected against thermal overloading by shutting down.

¹⁾ Factory setting: not activated (can be parameterized)

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Function (continued)

Safety Integrated

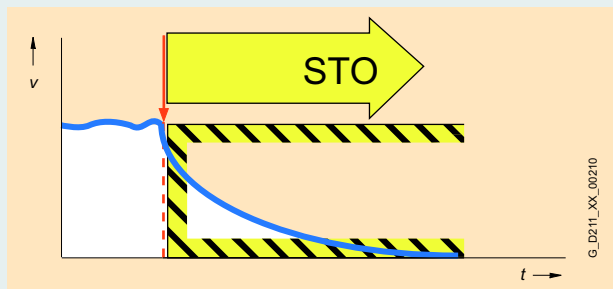
Safe Torque Off (STO)

Description of functions

This function prevents the drive from restarting unexpectedly in accordance with EN 60204-1, Section 5.4. Safe Torque Off disables the drive pulses and disconnects the power supply to the motor (corresponds to Stop Category 0 of EN 60204-1). The drive is reliably torque-free. This state is monitored internally in the drive.

Application, customer benefits

STO has the immediate effect that the drive cannot supply any torque-generating energy. STO can be used wherever the drive will reach a standstill in a sufficiently short time based on the load or when coasting down of the drive will not have any relevance for safety.



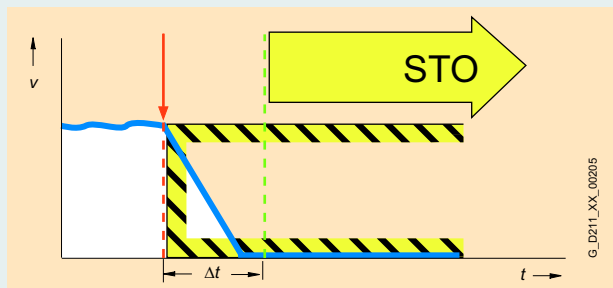
Safe Stop 1 (SS1)

Description of functions

The Safe Stop 1 function can safely stop the drive in accordance with EN 60204-1, Stop Category 1. When the SS1 function is selected, the drive brakes along a quick stop ramp (OFF3) and automatically activates the Safe Torque Off when the parameterized safety delay timer runs down.

Application, customer benefits

When the stop function is activated and it does not come to a halt quickly enough due to the load inertia, it can be actively braked by the converter. This integrated quick braking function eliminates the need for costly mechanical brakes that are subject to wear.



The Safety Integrated functions STO and SS1 of SINAMICS G150 are certified by independent institutes. The appropriate external test certificates and manufacturer declarations are available from the Siemens representatives, as well as at <http://support.automation.siemens.com/WW/view/en/23158850>

Terminal module for controlling functions STO and SS1 (option K82)

The integrated safety functions, starting from the Safety Integrated (SI) input terminals of the SINAMICS components (Control Unit, Power Module), satisfy the requirements specified in the Machinery Directive 98/37/EC, EN 60204-1, DIN EN ISO 13849-1 Category 3 (formerly EN 954-1) for Performance Level (PL) d and IEC 61508 SIL2. These are certified by the BGI A. In combination with option K82, the safety functions comply with Machinery Directive 98/37/EC, EN 60204-1 and DIN EN ISO 13849-1 Category 3 (formerly EN 954-1) for Performance Level (PL) d.

Power unit protection

Ground fault monitoring on the output side

A ground fault on the output side is detected by aggregate current monitoring and results in shutdown in grounded networks.

Electronic short-circuit protection on output side

A short-circuit (e.g. on the converter output terminals, in the motor cable or in the motor's terminal box) is detected on the output side and the converter switches off with a fault.

Thermal overload protection

A warning message is issued first when the overtemperature threshold responds. If the temperature rises further, either a shutdown is carried out or an automatic influencing of the pulse frequency or output current takes place so that a reduction in the thermal load is achieved. After elimination of the cause of the fault (e.g. improvement in the ventilation), the original operating values are automatically resumed.

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Technical specifications

Electrical data	Single circuit	Parallel circuit	
Line voltages and power ranges	• 380 ... 480 V 3 AC, ±10 % (-15 % < 1 min) 110 ... 560 kW • 500 ... 600 V 3 AC, ±10 % (-15 % < 1 min) 110 ... 560 kW • 660 ... 690 V 3 AC, ±10 % (-15 % < 1 min) 75 ... 800 kW	630 ... 900 kW 630 ... 1000 kW 1000 ... 1500 kW	
Types of supplies	TN/TT systems or isolated systems (IT systems)		
Line frequency	47 ... 63 Hz		
Output frequency	0 ... 300 Hz		
Power factor			
- Fundamental mode	> 0.98		
- Total	0.93 ... 0.96		
Converter efficiency	> 98 %		
Control method	Vector Control with and without sensor or <i>V/f</i> control		
Fixed speeds	15 fixed speeds plus 1 minimum speed, parameterizable (in the default setting, 3 fixed setpoints plus 1 minimum speed are selectable using terminal block/PROFIBUS)		
Skipped speed ranges	4, parameterizable		
Setpoint resolution	0.001 rpm digital 12 bit analog		
Braking operation	Optional via braking unit		
Mechanical data			
Degree of protection	IP20 (higher degrees of protection up to IP54 optional)		
Protection class I	In accordance with EN 50178 Part 1 ¹⁾		
Cooling method	Forced air cooling AF in accordance with EN 60146		
Sound pressure level <i>L</i> _{pA} (1 m)	≤ 72 dB at 50 Hz line frequency	≤ 75 dB	
Shock protection	BGVA3		
Cabinet system	Rittal TS 8, doors with double-barb lock, three-section base plates for cable entry		
Paint finish	RAL 7035 (indoor requirements)		
Compliance with standards			
Standards	EN 50178 ¹⁾ EN 60146-1, EN 61800-2, EN 61800-3, EN 60204-1, EN 60529 ²⁾		
CE marking	In accordance with EMC directive No. 2004/108/EC and low-voltage directive No. 2006/95/EC		
EMC conformance	The SINAMICS G150 converter systems are not designed for connection to the public power network ("First environment"). EMC conformance is compliant with the EMC product standard for variable-speed drives EN 61800-3, "Second environment" (industrial networks). The equipment can cause electromagnetic interference when it is connected to the public network. If supplementary measures are taken, (e.g. line filters, → option L00), it can also be operated in the "First environment".		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +55 °C	-25 ... +70 °C from -40 °C for 24 hours	<u>0</u> ... +40 °C up to +50 °C see derating data
Relative humidity ²⁾ (non-condensing)	<u>5 ... 95 %</u>	5 ... 95 % at 40 °C	5 ... <u>95 %</u>
	Class 1K4 to EN 60721-3-1	Class 2K3 to EN 60721-3-2	Class 3K3 to EN 60721-3-3
Environmental class/harmful chemical substances ²⁾	Class 1C2 to EN 60721-3-1	Class 2C2 to EN 60721-3-2	Class 3C2 to EN 60721-3-3
Organic/biological influences ²⁾	Class 1B1 to EN 60721-3-1	Class 2B1 to EN 60721-3-2	Class 3B1 to EN 60721-3-3
Installation altitude	Up to 2000 m above sea level without derating, > 2000 m see derating data		
Strain resistance	Storage	Transport	Operation
Vibratory load ²⁾			
- Deflection	1.5 mm at <u>5 ... 9 Hz</u>	<u>3.1 mm</u> at 5 ... 9 Hz	0.075 mm at 10 ... 58 Hz
- Acceleration	5 m/s ² at > 9 ... 200 Hz	10 m/s ² at > 9 ... 200 Hz	10 m/s ² at > 58 ... 200 Hz
	Class 1M2 to EN 60721-3-1	Class 2M2 to EN 60721-3-2	–
Shock load ²⁾			
- Acceleration	40 m/s ² at 22 ms	100 m/s ² at 11 ms	100 m/s ² at 11 ms
	Class 1M2 to EN 60721-3-1	Class 2M2 to EN 60721-3-2	Class 3M4 to EN 60721-3-3

Deviations from the defined classes are identified by underlining.

¹⁾ The EN standard specified is the European edition of international standard IEC 62103.

²⁾ The EN standards specified are the European editions of the international IEC standards with the same designations.

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Technical specifications (continued)

Derating data

Compensation of current derating as a function of installation altitude/ambient temperature

If the SINAMICS G150 drive converter cabinet units are operated at an **installation altitude > 2000 m** above sea level, factors relating to a reduction of the maximum permissible output current (derating) must be taken into account. These are specified in the tables below. It must be ensured that the air flow corresponds to the rate specified in the technical specifications tables. The specified values already include a permitted correction between installation altitude and ambient temperature (incoming air temperature at the inlet to the drive converter cabinet unit).

Installation altitude above sea level m	Current derating at an ambient temperature of						
	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
0-2000						95.0 %	87.0 %
2001-2500					96.3 %	91.4 %	83.7 %
2501-3000	100 %			96.2 %	92.5 %	87.9 %	80.5 %
3001-3500			96.7 %	92.3 %	88.8 %	84.3 %	77.3 %
3501-4000		97.8 %	92.7 %	88.4 %	85.0 %	80.8 %	74.0 %

Current derating depending on ambient temperature (inlet-air temperature) and installation altitude for cabinet units with degree of protection IP20, IP21, IP23 and IP43

Installation altitude above sea level m	Current derating at an ambient temperature of						
	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C
0-2000					95.0 %	87.5 %	80.0 %
2001-2500	100 %			96.3 %	91.4 %	84.2 %	77.0 %
2501-3000			96.2 %	92.5 %	87.9 %	81.0 %	74.1 %
3001-3500		96.7 %	92.3 %	88.8 %	84.3 %	77.7 %	71.1 %
3501-4000	97.8 %	92.7 %	88.4 %	85.0 %	80.8 %	74.7 %	68.0 %

Current derating depending on ambient temperature (inlet-air temperature) and installation altitude for cabinet units with degree of protection IP54

Voltage derating as a function of installation altitude

In addition to current derating, voltage derating must be considered in accordance with the following table with **installation altitudes > 2000 m** above sea level.

Installation altitude above sea level m	Voltage derating for a rated input voltage of												
	380 V	400 V	420 V	440 V	460 V	480 V	500 V	525 V	550 V	575 V	600 V	660 V	690 V
0-2000												100 %	
2001-2250						96 %							96 %
2251-2500					98 %	94 %						98 %	94 %
2501-2750	100 %			98 %	94 %	90 %	100 %					94 %	90 %
2751-3000				95 %	91 %	88 %						91 %	88 %
3001-3250			97 %	93 %	89 %	85 %					98 %	89 %	85 %
3251-3500		98 %	93 %	89 %	85 %	82 %				98 %	94 %	85 %	82 %
3501-3750		95 %	91 %	87 %	83 %	79 %			98 %	95 %	91 %	–	–
3751-4000	96 %	92 %	87 %	83 %	80 %	76 %			95 %	91 %	87 %	–	–

Voltage derating depending on installation altitude

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Technical specifications (continued)Current derating depending on pulse frequency

To reduce motor noise or to increase output frequency, the pulse frequency can be increased relative to the factory setting. When the pulse frequency is increased, the derating factor of the

output current must be taken into account. This derating factor must be applied to the currents specified in the technical specifications.

Order No. 6SL3710-...	Power [kW]	Output current at 2 kHz [A]	Derating factor at 4 kHz
380 ... 480 V 3 AC			
1GE32-1A0	110	210	82 %
1GE32-6A0	132	260	83 %
1GE33-1A0	160	310	88 %
1GE33-8A0	200	380	87 %
1GE35-0A0	250	490	78 %

Derating factor of the output current depending on the pulse frequency for units with a rated pulse frequency of 2 kHz

Order No. 6SL3710-...	Power [kW]	Output current at 1.25 kHz [A]	Derating factor at 2.5 kHz
380 ... 480 V 3 AC			
1GE36-1A0	315	605	72 %
1GE37-5A0	400	745	72 %
1GE38-4A0	450	840	79 %
1GE41-0A0	560	985	87 %
2GE41-1AA0	630	1120	72 %
2GE41-4AA0	710	1380	72 %
2GE41-6AA0	900	1560	79 %
500 ... 600 V 3 AC			
1GF31-8A0	110	175	87 %
1GF32-2A0	132	215	87 %
1GF32-6A0	160	260	88 %
1GF33-3A0	200	330	82 %
1GF34-1A0	250	410	82 %
1GF34-7A0	315	465	87 %
1GF35-8A0	400	575	85 %
1GF37-4A0	500	735	79 %
1GF38-1A0	560	810	72 %
2GF38-6AA0	630	860	87 %
2GF41-1AA0	710	1070	85 %
2GF41-4AA0	1000	1360	79 %
660 ... 690 V 3 AC			
1GH28-5A0	75	85	89 %
1GH31-0A0	90	100	88 %
1GH31-2A0	110	120	88 %
1GH31-5A0	132	150	84 %
1GH31-8A0	160	175	87 %
1GH32-2A0	200	215	87 %
1GH32-6A0	250	260	88 %
1GH33-3A0	315	330	82 %
1GH34-1A0	400	410	82 %
1GH34-7A0	450	465	87 %
1GH35-8A0	560	575	85 %
1GH37-4A0	710	735	79 %
1GH38-1A0	800	810	72 %
2GH41-1AA0	1000	1070	85 %
2GH41-4AA0	1350	1360	79 %
2GH41-5AA0	1500	1500	72 %

Derating factor of the output current depending on the pulse frequency for units with a rated pulse frequency of 1.25 kHz

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Technical specifications (continued)

Degrees of protection of cabinet units

Standard EN 60529 applies to the protection of electrical equipment by means of housings, covers or equivalent, and includes:

- Protection of persons against accidental contact with live or moving parts within the housing and protection of the equipment against the ingress of solid foreign bodies (touch protection and protection against ingress of foreign bodies)
- Protection of the equipment against the ingress of water (water protection)
- Abbreviations for the internationally agreed degrees of protection.

The degrees of protection are specified by abbreviations comprising the code letters IP and two digits.

Degrees of protection of the drive converter cabinet unit	First digit (touch protection and protection against ingress of solid objects)	Second digit (protection of the equipment against the ingress of water)
IP20 (standard)	Protected against solid objects, diameter ≥ 12.5 mm.	No water protection
IP21 (option M21)	Protected against solid objects, diameter ≥ 12.5 mm.	Protected against vertically falling water drops Vertically falling water drops shall not have a harmful effect.
IP23 (option M23)	Protected against solid objects, diameter ≥ 12.5 mm.	Protected against spraying water Water sprayed on both sides of the vertical at an angle of up to 60° shall not have a harmful effect.
IP43 (option M43)	Protected against solid objects, diameter ≥ 1 mm.	Protected against spraying water Water sprayed on both sides of the vertical at an angle of up to 60° shall not have a harmful effect.
IP54 (option M54)	Dust protected. Ingress of dust is not totally prevented, but dust must not be allowed to enter in such quantities that the functioning or safety of the equipment is impaired.	Protected against splashing water Water splashing onto the enclosure from any direction shall not have a harmful effect.

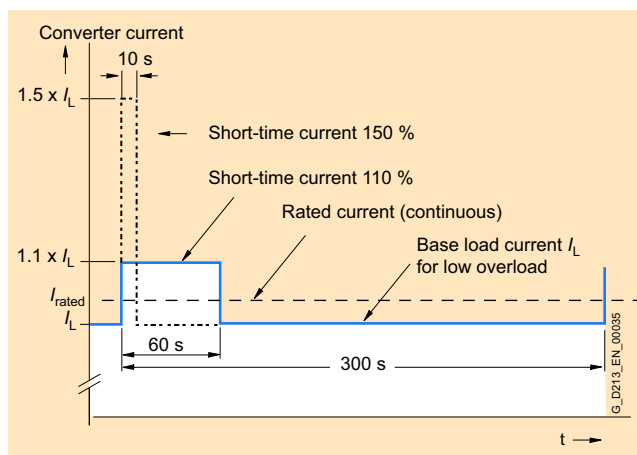
Overload capacity

SINAMICS G150 drive converter cabinet units are equipped with an overload reserve to deal with breakaway torques, for example. If larger surge loads occur, this must be taken into account when configuring. In drives with overload requirements, the appropriate base load current must therefore be used as a basis for the required load.

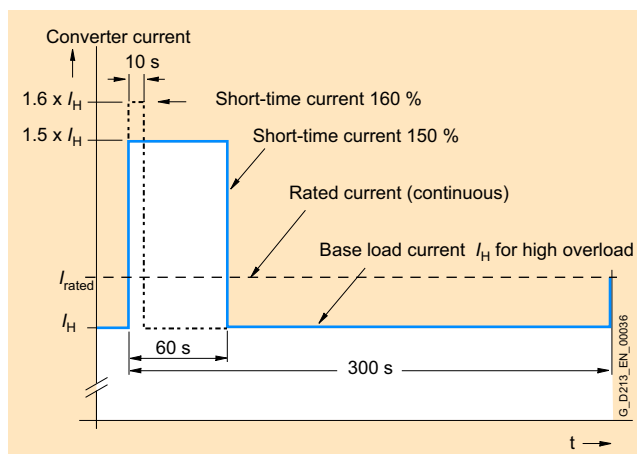
The criterion for overload is that the drive is operated with its base load current before and after the overload occurs, and a load duration of 300 s is assumed here.

The base load current I_L for a low overload is based on a load cycle of 110 % for 60 s or 150 % for 10 s.

The base load current I_H for a high overload is based on a load cycle of 150 % for 60 s or 160 % for 10 s.



Low overload



High overload

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Technical specifications (continued)

EMC guidelines

The electromagnetic compatibility describes - in accordance with the definition of the EMC directive - the "capability of a device to work satisfactorily in the electromagnetic environment without itself causing electromagnetic interferences which are unacceptable for other devices present in this environment". To guarantee that the appropriate EMC directives are observed, the devices must demonstrate a sufficiently high noise immunity, and also the emitted interference must be limited to acceptable values.

The EMC requirements for "Variable-speed drive systems" are described in the product standard EN 61800-3. A variable-speed drive system (or power drive system PDS) consists of the drive converter and the electric motor including cables. The driven machine is not part of the drive system. EN 61800-3 defines different limits depending on the location of the drive system, referred to as the first and second environments.

The **first environment** comprises living accommodation or locations where the drive system is directly connected to a public low-voltage network without an intermediate transformer.

The **second environment** is understood to be all locations outside living areas. These are basically industrial areas which are powered from the medium-voltage network via their own transformers.

Four different categories are defined in EN 61800-3 depending on the location and the power of the drive:

Category C1: Drive systems for rated voltages < 1000 V for unlimited use in the first environment.

Category C2: Stationary drive systems for rated voltages < 1000 V for use in the second environment. Use in the first environment is possible if the drive system is installed and used by qualified personnel. The warning and installation information supplied by the manufacturer must be observed.

Category C3: Drive systems for rated voltages < 1000 V for exclusive use in the second environment.

Category C4: Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A for use in complex systems in the second environment.

The following graphic shows the assignment of the four categories to the first and second environment:

First environment	C1	Second environment
	C2	
	C3	
	C4	

G_D213_EN_00009

SINAMICS G150 drive converter cabinet units are almost exclusively used in the second environment (categories C3 and C4).

To limit **emitted interference**, the SINAMICS G150 drive converter cabinet units are equipped as standard with an RFI suppression filter in accordance with the limit values specified in Category C3. This means that they meet the requirements for industrial use. Line filters (option L00) are available for use in the first environment (Category C2).

SINAMICS G150 drive converter cabinet units fulfill the requirements for **noise immunity** defined in EN 61800-3 for the second environment and consequently also the lower noise immunity values in the first environment.

The warning and installation information (part of the device documentation) must be observed.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Technical specifications (continued)

Technical specifications for single circuit

Line voltage 380 ... 480 V 3 AC		SINAMICS G150 drive converter cabinet units 6SL3710-1GE								
		32-1...	32-6...	33-1...	33-8...	35-0...	36-1...	37-5...	38-4...	41-0...
Type rating										
• with I_L at 50 Hz 400 V ¹⁾	kW	110	132	160	200	250	315	400	450	560
• with I_H at 50 Hz 400 V ¹⁾	kW	90	110	132	160	200	250	315	400	450
• with I_L at 60 Hz 460 V ²⁾	hp	150	200	250	300	400	500	600	600	800
• with I_H at 60 Hz 460 V ²⁾	hp	125	150	200	250	350	350	450	500	700
Output current										
• Rated current I_{rated}	A	210	260	310	380	490	605	745	840	985
• Base load current I_L ³⁾	A	205	250	302	370	477	590	725	820	960
• Base load current I_H ⁴⁾	A	178	233	277	340	438	460	570	700	860
Input current										
• Rated input current ⁵⁾	A	229	284	338	395	509	629	775	873	1024
• Input current, max.	A	335	410	495	606	781	967	1188	1344	1573
• Current requirement auxiliary supply 24 V DC ⁶⁾	A	1.1	1.1	1.35	1.35	1.35	1.4	1.4	1.4	1.5
Power loss	kW	2.9	3.8	4.4	5.3	6.4	8.2	9.6	10.1	14.4
Cooling air requirement	m ³ /s	0.17	0.23	0.36	0.36	0.36	0.78	0.78	0.78	1.48
Cable lengths between converter and motor ⁸⁾										
• Shielded	m	300	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450	450
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	67/68	69/73	69/73	69/73	69/73	70/73	70/73	70/73	72/75
Dimensions										
• Width for version A/C	mm	800/400	800/400	800/400	1000/400	1000/400	1200/600	1200/600	1200/600	1600/1000
• Height ⁷⁾	mm	2000	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600	600
Weight (without options) for version A/C, approx.	kg	320/225	320/225	390/300	480/300	480/300	860/670	865/670	1075/670	1360/980

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

¹⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 400 V 3 AC 50 Hz.

²⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 460 V 3 AC 60 Hz.

³⁾ The base load current I_L is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.
See technical specifications (→ Overload capacity).

⁴⁾ The base load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.
See technical specifications (→ Overload capacity).

⁵⁾ The current values given here are based on the rated output current.

⁶⁾ If the main power supply fails and drive control remains active, the Power Module must be externally supplied with 24 V DC.
The following should also be taken into account:

– CU320: 0.8 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A

– Current requirement of digital inputs/outputs.

⁷⁾ Version A: The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54, 405 mm for the **M13** and **M78** options.
Version C: The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54.

⁸⁾ Longer cable lengths for specific configurations are available on request.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Technical specifications (continued)

Line voltage 500 ... 600 V 3 AC		SINAMICS G150 drive converter cabinet units 6SL3710-1GF								
		31-8...	32-2...	32-6...	33-3...	34-1...	34-7...	35-8...	37-4...	38-1...
Type rating										
• with I_L at 50 Hz 500 V ¹⁾	kW	110	132	160	200	250	315	400	500	560
• with I_H at 50 Hz 500 V ¹⁾	kW	90	110	132	160	200	250	315	450	500
• with I_L at 60 Hz 575 V ²⁾	hp	150	200	250	300	400	450	600	700	800
• with I_H at 60 Hz 575 V ²⁾	hp	150	200	200	250	350	450	500	700	700
Output current										
• Rated current I_{rated}	A	175	215	260	330	410	465	575	735	810
• Base load current I_L ³⁾	A	171	208	250	320	400	452	560	710	790
• Base load current I_H ⁴⁾	A	157	192	233	280	367	416	514	657	724
Input current										
• Rated input current ⁵⁾	A	191	224	270	343	426	483	598	764	842
• Input current, max.	A	279	341	410	525	655	740	918	1164	1295
• Current requirement auxiliary supply 24 V DC ⁶⁾	A	1.35	1.35	1.35	1.4	1.4	1.4	1.4	1.5	1.5
Power loss	kW	3.8	4.2	5.0	6.1	8.1	7.8	8.7	12.7	14.1
Cooling air requirement	m ³ /s	0.36	0.36	0.36	0.36	0.78	0.78	0.78	1.48	1.48
Cable lengths between converter and motor ⁸⁾										
• Shielded	m	300	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450	450
Sound pressure level L_{pa} (1 m) at 50/60 Hz	dB	69/73	69/73	69/73	69/73	72/75	72/75	72/75	72/75	72/75
Dimensions										
• Width for version A/C	mm	800/400	800/400	800/400	800/400	1200/600	1200/600	1200/600	1600/1000	1600/1000
• Height ⁷⁾	mm	2000	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600	600
Weight (without options) for version A/C, approx.	kg	390/300	390/300	390/300	390/300	860/670	860/670	860/670	1320/940	1360/980

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

¹⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 500 V 3 AC 50 Hz.

²⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 575 V 3 AC 60 Hz.

³⁾ The base load current I_L is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s. See technical specifications (→ Overload capacity).

⁴⁾ The base load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s. See technical specifications (→ Overload capacity).

⁵⁾ The current values given here are based on the rated output current.

⁶⁾ If the main power supply fails and drive control remains active, the Power Module must be externally supplied with 24 V DC.

The following should also be taken into account:

– CU320: 0.8 A
– TM31: 0.5 A
– AOP30: 0.2 A
– SMC: 0.6 A

– Current requirement of digital inputs/outputs.

⁷⁾ Version A: The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54, 405 mm for the **M13** and **M78** options.
Version C: The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54.

⁸⁾ Longer cable lengths for specific configurations are available on request.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Technical specifications (continued)

Line voltage 660 ... 690 V 3 AC		SINAMICS G150 drive converter cabinet units 6SL3710-1GH												
		28-5...	31-0...	31-2...	31-5...	31-8...	32-2...	32-6...	33-3...	34-1...	34-7...	35-8...	37-4...	38-1...
Type rating														
• with I_L at 50 Hz 690 V ¹⁾	kW	75	90	110	132	160	200	250	315	400	450	560	710	800
• with I_H at 50 Hz 690 V ¹⁾	kW	55	75	90	110	132	160	200	250	315	400	450	560	710
Output current														
• Rated current I_{rated}	A	85	100	120	150	175	215	260	330	410	465	575	735	810
• Base load current I_L ³⁾	A	80	95	115	142	171	208	250	320	400	452	560	710	790
• Base load current I_H ⁴⁾	A	76	89	107	134	157	192	233	280	367	416	514	657	724
Input current														
• Rated input current ⁵⁾	A	93	109	131	164	191	224	270	343	426	483	598	764	842
• Input current, max.	A	131	155	188	232	279	341	410	525	655	740	918	1164	1295
• Current requirement auxiliary supply 24 V DC ⁶⁾	A	1.1	1.1	1.1	1.1	1.35	1.35	1.35	1.35	1.4	1.4	1.4	1.5	1.5
Power loss	kW	1.7	2.1	2.7	2.8	3.8	4.2	5.0	6.1	8.1	9.1	10.8	13.5	14.7
Cooling air requirement	m ³ /s	0.17	0.17	0.17	0.17	0.36	0.36	0.36	0.36	0.78	0.78	0.78	1.48	1.48
Cable lengths between converter and motor ⁸⁾														
• Shielded	m	300	300	300	300	300	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450	450	450	450	450	450
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	67/68	67/68	67/68	67/68	67/73	67/73	67/73	67/73	72/75	72/75	72/75	72/75	72/75
Dimensions														
• Width for version A/C	mm	800/ 400	800/ 400	800/ 400	800/ 400	800/ 400	800/ 400	800/ 400	800/ 400	1200/ 600	1200/ 600	1200/ 600	1600/ 1000	1200/ 1000
• Height ⁷⁾	mm	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600	600	600	600	600	600
Weight (without options) for version A/C, approx.	kg	320/ 225	320/ 225	320/ 225	320/ 225	390/ 300	390/ 300	390/ 300	390/ 300	860/ 670	860/ 670	860/ 670	1320/ 940	1360/ 980

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

¹⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 690 V 3 AC 50 Hz.

³⁾ The base load current I_L is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.
See technical specifications (→ Overload capacity).

⁴⁾ The base load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.
See technical specifications (→ Overload capacity).

⁵⁾ The current values given here are based on the rated output current.

⁶⁾ If the main power supply fails and drive control remains active, the Power Module must be externally supplied with 24 V DC.

The following should also be taken into account:

- CU320: 0.8 A
- TM31: 0.5 A
- AOP30: 0.2 A
- SMC: 0.6 A

– Current requirement of digital inputs/outputs.

⁷⁾ Version A: The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54, 405 mm for the **M13** and **M78** options.
Version C: The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54.

⁸⁾ Longer cable lengths for specific configurations are available on request.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Technical specifications (continued)

Technical specifications for parallel circuit

SINAMICS G150 drive converter cabinet units, version A										
Type 6SL3710-										
		2GE41- 1AA0	2GE41- 4AA0	2GE41- 6AA0	2GF38- 6AA0	2GF41- 1AA0	2GF41- 4AA0	2GH41- 1AA0	2GH41- 4AA0	2GH41- 5AA0
Line voltage		380 ... 480 V 3 AC			500 ... 600 V 3 AC			660 ... 690 V 3 AC		
Type rating										
• with I_L ¹⁾	kW	630	710	900	630	710	1000	1000	1350	1500
• with I_H ¹⁾	kW	500	560	710	560	630	800	900	1200	1350
• with I_L at 60 Hz 460 V or 575 V ²⁾	hp	900	1000	1250	900	1000	1250	–	–	–
• with I_H at 60 Hz 460 V or 575 V ²⁾	hp	700	900	1000	800	900	1000	–	–	–
Output current										
• Rated current I_{rated} ⁸⁾	A	1120	1380	1560	860	1070	1360	1070	1360	1500
• Base load current I_L ^{3) 8)}	A	1092	1340	1516	836	1036	1314	1036	1314	1462
• Base load current I_H ^{4) 8)}	A	850	1054	1294	770	950	1216	950	1216	1340
Input current										
• Rated input current ^{5) 8)}	A	1174	1444	1624	904	1116	1424	1116	1424	1568
• Input current, max.		1800	2215	2495	1388	1708	2186	1708	2186	2406
• Current requirement auxil- iary supply 24 V DC ⁶⁾	A	2.8	2.8	3.0	2.8	2.8	3.0	2.8	2.8	3.0
Power loss	kW	16.2	19.0	19.9	15.4	17.2	23.8	21.3	26.6	29.0
Cooling air requirement	m ³ /s	1.56	1.56	1.56	1.56	1.56	2.96	1.56	2.96	2.96
Cable lengths between converter and motor ¹⁰⁾										
• Shielded	m	300	300	300	300	300	300	300	300	300
• Unshielded	m	450	450	450	450	450	450	450	450	450
Sound pressure level L_{pA} (1 m) at 50/60 Hz	dB	73/76	73/76	73/76	75/78	75/78	75/78	75/78	75/78	75/78
Dimensions										
• Width ⁹⁾	mm	2400	2400	2400	2400	2400	3200	2400	3200	3200
• Height ⁷⁾	mm	2000	2000	2000	2000	2000	2000	2000	2000	2000
• Depth	mm	600	600	600	600	600	600	600	600	600
Weight (without options), approx.	kg	1700	1710	2130	1700	1700	2620	1700	2620	2700

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

Note:

In the case of converters with power units connected in parallel, units with a rated input current of

- <1500 A require option **L13**.
 - ≥1500 A require option **L26**.
- (→ Selection and ordering data)

¹⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 400 V, 500 V or 690 V 3 AC 50 Hz.
²⁾ Rated output of a typ. 6-pole standard induction motor based on I_L or I_H at 460 V or 575 V 3 AC 60 Hz.
³⁾ The base load current I_L is based on a load cycle of 110 % for 60 s or 150 % for 10 s with a load cycle period of 300 s.
See technical specifications (→ Overload capacity).
⁴⁾ The base load current I_H is based on a load cycle of 150 % for 60 s or 160 % for 10 s with a load cycle period of 300 s.
See technical specifications (→ Overload capacity).
⁵⁾ The current values given here are based on the rated output current.

⁶⁾ If the main power supply fails and drive control remains active, the Power Module must be externally supplied with 24 V DC.

The following should also be taken into account:

- CU320: 0.8 A
- TM31: 0.5 A
- AOP30: 0.2 A
- SMC: 0.6 A
- Current requirement of digital inputs/outputs.

⁷⁾ The cabinet height is increased by 250 mm for degree of protection IP21, 400 mm for degrees of protection IP23, IP43 and IP54, 405 mm for the **M13** and **M78** options.

⁸⁾ The currents listed here represent the aggregate current of both converter sections.

⁹⁾ The power units connected in parallel are supplied as two transport units.

¹⁰⁾ Longer cable lengths for specific configurations are available on request.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Selection and ordering data

Single circuit

Type rating		Rated output current	SINAMICS G150 drive converter cabinet units
at 400 V, 500 V or 690 V	at 60 Hz/ 460 V or 575 V		(Order No. supplement, see below)
kW	hp	A	Order No.
380 ... 480 V 3 AC			
110	150	210	6SL3710-1GE32-1A0
132	200	260	6SL3710-1GE32-6A0
160	250	310	6SL3710-1GE33-1A0
200	300	380	6SL3710-1GE33-8A0
250	400	490	6SL3710-1GE35-0A0
315	500	605	6SL3710-1GE36-1A0
400	600	745	6SL3710-1GE37-5A0
450	700	840	6SL3710-1GE38-4A0
560	800	985	6SL3710-1GE41-0A0
500 ... 600 V 3 AC			
110	150	175	6SL3710-1GF31-8A0
132	200	215	6SL3710-1GF32-2A0
160	250	260	6SL3710-1GF32-6A0
200	300	330	6SL3710-1GF33-3A0
250	400	410	6SL3710-1GF34-1A0
315	450	465	6SL3710-1GF34-7A0
400	600	575	6SL3710-1GF35-8A0
500	700	735	6SL3710-1GF37-4A0
560	800	810	6SL3710-1GF38-1A0
660 ... 690 V 3 AC			
75		85	6SL3710-1GH28-5A0
90		100	6SL3710-1GH31-0A0
110		120	6SL3710-1GH31-2A0
132		150	6SL3710-1GH31-5A0
160		175	6SL3710-1GH31-8A0
200		215	6SL3710-1GH32-2A0
250		260	6SL3710-1GH32-6A0
315		330	6SL3710-1GH33-3A0
400		410	6SL3710-1GH34-1A0
450		465	6SL3710-1GH34-7A0
560		575	6SL3710-1GH35-8A0
710		735	6SL3710-1GH37-4A0
800		810	6SL3710-1GH38-1A0

Order No. supplement

Version A with possibility for mounting all connection components	A
Version C Especially for space-saving mounting	C

Parallel circuit

Type rating		Rated output current	SINAMICS G150 drive converter cabinet units, Version A
at 400 V, 500 V or 690 V	at 60 Hz/ 460 V or 575 V		(Order No. supplement, see below)
kW	hp	A	Order No.
380 ... 480 V 3 AC			
630	900	1120	6SL3710-2GE41-1AA0
710	1000	1380	6SL3710-2GE41-4AA0
900	1250	1560	6SL3710-2GE41-6AA0
500 ... 600 V 3 AC			
630	900	860	6SL3710-2GF38-6AA0
710	1000	1070	6SL3710-2GF41-1AA0
1000	1250	1360	6SL3710-2GF41-4AA0
660 ... 690 V 3 AC			
1000		1070	6SL3710-2GH41-1AA0
1350		1360	6SL3710-2GH41-4AA0
1500		1500	6SL3710-2GH41-5AA0

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

In the case of converters with parallel-connected power units, both converter sections must be simultaneously connected to the supply network as the DC links of the two sections are coupled. For this reason, units with parallel circuit require the following components: Line contactors (option **L13** for converters with a rated input current of < 1500 A) or circuit-breakers (option **L26** for converters with a rated input current of ≥ 1500 A).

SINAMICS G150 drive converter cabinet units, Version A	Rated input current	Order code (option)
	A	
380 ... 480 V 3 AC		
6SL3710-2GE41-1AA0	1174	L13 (line contactor)
6SL3710-2GE41-4AA0	1444	L13 (line contactor)
6SL3710-2GE41-6AA0	1624	L26 (circuit-breaker)
500 ... 600 V 3 AC		
6SL3710-2GF38-6AA0	904	L13 (line contactor)
6SL3710-2GF41-1AA0	1116	L13 (line contactor)
6SL3710-2GF41-4AA0	1424	L13 (line contactor)
660 ... 690 V 3 AC		
6SL3710-2GH41-1AA0	1116	L13 (line contactor)
6SL3710-2GH41-4AA0	1424	L13 (line contactor)
6SL3710-2GH41-5AA0	1568	L26 (circuit-breaker)

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options

Note: When ordering a converter with options, add "-Z" to the order number of the converter, followed by the order code(s) for the desired option(s).

Example:
6SL3710-1GE32-1CA0-Z
+M07+D60+...

See also ordering examples.

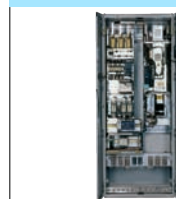
Available options	Order code	for version A	for version C
Line-side options			
Line filter (RFI) for use in the first environment in accordance with EN 61800-3, Category C2 (TN/TT systems)	L00		—
Line contactor (for currents ≤ 800 A with a single circuit or < 1500 A with a parallel circuit)	L13		—
Delivery without line reactor	L22		
Line reactor $V_k = 2\%$	L23		
Main control switch including fuses resp. circuit-breaker	L26		—
EMC shield busbar ¹⁾	M70		
PE (ground) busbar ¹⁾	M75		
Load-side options			
Motor reactor	L08		—
dv/dt filter plus Voltage Peak Limiter	L10		—
Sine-wave filter (up to 250 kW at 380 ... 480 V, up to 132 kW at 500 ... 600 V)	L15		—
EMC shield busbar ¹⁾	M70		
PE (ground) busbar ¹⁾	M75		
Motor protection and safety functions			
EMERGENCY OFF pushbutton, door mounted	L45		—
EMERGENCY OFF Category 0, 230 V AC or 24 V DC	L57		—
EMERGENCY STOP Category 1, 230 V AC ²⁾	L59		—
EMERGENCY STOP Category 1, 24 V DC ²⁾	L60		—
Thermistor motor protection unit with PTB approval (alarm)	L83		—
Thermistor motor protection unit with PTB approval (shutdown)	L84		—
PT100 evaluation unit (for six PT100 sensors)	L86		—
Insulation monitoring	L87		—
Additional touch protection	M60		
Increase in degree of protection			
IP21 Degree of protection	M21		
IP23 Degree of protection	M23		
IP43 Degree of protection	M43		
IP54 Degree of protection	M54		
Mechanical options			
Base 100 mm high, RAL 7022	M06		
Cable plinth 200 mm high, RAL 7035	M07		
Top cable entry, line side	M13		—
Top cable entry, motor side	M78		—
Crane transport assembly (top-mounted)	M90		

	possible
—	not supported

¹⁾ This option is listed for the line-side and load-side options, but is only required once.

²⁾ The drive stop requirements must be taken into account with this option. Additional braking units may be required.

The selection matrix must be observed with respect to the combination of options.



Converter version A



Converter version C

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

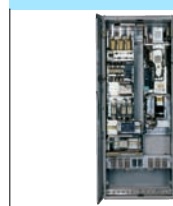
Available options	Order code	for version A	for version C
Other options			
CAN protocol CBC10 Communication Board	G20		
PROFINET CBE20 Communication Board	G33		
Additional TM31 customer terminal module	G61		–
SMC30 Sensor Module Cabinet-Mounted	K50		
VSM10 Voltage Sensing Module Cabinet-Mounted	K51		–
Terminal interface for "Safe Torque Off" and "Safe Stop 1" safety functions	K82		–
Connection for external auxiliary equipment (controlled, max. 10 A)	L19		–
Cabinet light with service socket	L50		–
Cabinet anti-condensation heating	L55		
Braking unit 25 kW (P_{20} power: 100 kW)	L61		–
Braking unit 50 kW (P_{20} power: 200 kW)	L62		–
Special cabinet paint finish ³⁾	Y09		
Documentation (standard: English/German)			
Customer documentation (circuit diagram, terminal diagram, layout diagram) in DXF format	D02		
Customer documentation in paper format	D04		
Preliminary copy of customer documentation	D14		
Documentation language: English/French	D58		
Documentation language: English/Spanish	D60		
Documentation language: English/Italian	D80		
Languages (standard: English/German)			
Rating plate language in English/French	T58		
Rating plate language in English/Spanish	T60		
Rating plate language in English/Italian	T80		
Options specific to the chemical industry			
NAMUR terminal block	B00		–
Safely isolated 24 V power supply (PELV)	B02		–
Separate output for external auxiliaries (uncontrolled)	B03		–
Options specific to the shipbuilding industry			
Marine version	M66		
Individual certificate from Germanischer Lloyd (GL)	E11		
Individual certificate from Lloyds Register (LR)	E21		
Individual certificate from Bureau Veritas (BV)	E31		
Individual certificate from Det Norske Veritas (DNV)	E51		
Individual certificate from American Bureau of Shipping (ABS)	E61		
Individual certificate from Chinese Classification Society (CCS)	E71		
Converter acceptance inspection in presence of customer			
Visual inspection	F03		
Function test of the converter without motor connected	F71		
Function test of the converter with test bay motor (no load)	F75		
Insulation test on converter	F77		
Customized converter acceptance (on request)	F97		

possible

– not supported

³⁾ The order code Y.. requires data in plain text.

The selection matrix must be observed with respect to the combination of options.



Converter version A



Converter version C

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

Option selection matrix

Certain options are mutually exclusive. The following tables only provide an overview. Please refer to the descriptions of the individual options for a precise description of options and other exclusions.

	possible combination
—	combination not supported

Electrical options

	G20	G33	K50	K51	K82	L00	L13	L15	L19	L22	L23	L26	L45	L50	L55	L57	L59	L60	L61	L62	L83	L84	L86	L87
G20		—																						
G33	—																							
K50				—																				
K51			—																					
K82																								4)
L00										—	1)													—
L13												2)				3)	3)	3)						
L15																								
L19																								
L22						—					—													
L23						1)				—														
L26							2)									3)	3)	3)						
L45																								
L50																								
L55																								
L57							3)				3)						—	—						
L59							3)				3)						—	—						
L60							3)				3)						—	—						
L61																				—				
L62																			—					
L83																								
L84																								
L86																								
L87					4)	—																		

1) For converters < 500 kW/700 hp, the line reactor (order code **L23**) is supplied with the converter as standard.
For converters ≥ 500 kW/700 hp, option **L23** must be ordered if

- the converters are to be operated on lines with short-circuit power (RSC > 20) or
- a line filter is used (option **L00**).

2) Combination **L13/L26** is only possible for currents of < 800 A. Circuit-breakers are used from 800 A upwards. These perform the same function as options **L13** and **L26**.

3) Converters in a single circuit require either option **L13** or, for currents of > 800 A option **L26** (circuit-breaker).
Converters in a parallel circuit require **L13** or **L26**.
Braking units may also be needed, depending on the drive stopping time required.

4) K82 and L87 can be combined as standard for converters with parallel-connected power units. This combination is available on request for converters in a single circuit.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

Mechanical options/electrical options

	L00	L08	L10	L15	M06	M07	M13	M21	M23	M43	M54	M60	M66	M70	M75	M78	M90
L00														5)			
L08																	
L10																	
L15																	
M06																	
M07																	
M13														6)	6)		
M21												7)					
M23													8)				
M43																	
M54																	
M60																	
M66																	
M70	5)						6)									5)	
M75							6)									5)	
M78														5)	5)		
M90																	

5) Option **L00** includes option **M70**.

6) If the line connection (option **M13**) and the motor connection (option **M78**) are from above, the EMC shield bus (option **M70**) and the PE busbar (option **M75**) are not required in the lower cabinet area.

7) Can only be selected for converters in the voltage range 400 V up to 250 kW, 500 V up to 200 kW and 690 V up to 315 kW. Option **M60** is supplied as standard for larger power ranges.

8) Option **M66** includes option **M23**.

Rating plate language

	T58	T60	T80
T58			
T60			
T80			

Ordering examples

Example 1

Task:

A drive converter cabinet unit is needed to control the fan speed for a 380 kW fan drive for connecting to an existing 400 V MCC outgoing circuit. The rated speed of the fan is 975 rpm. As a result of the ambient conditions, the converter should be mounted on a 100 mm cabinet base and the degree of protection should be IP54. The installation altitude is < 1000 m above sea level, the ambient temperature is 45 °C.

Solution:

Due to the existing MCC outgoing circuit, the line connection components, such as main switch, line contactor and line fuses, can be omitted and the space-saving version C can be selected. For this constellation, taking into account the derating factors for IP54 degree of protection and for the increased ambient temperature, a 450 kW, 400 V drive converter cabinet unit must be selected with options

M06 (100 mm cabinet base) and

M54 (IP54 degree of protection)

The relevant ordering data are:

6SL3710-1GE38-4CA0-Z
+**M06** +**M54**

Example 2

Task:

A 280 kW pump to control pressure equalization is to be supplied via a converter for a brand new district heating pumping station. A 690 V supply is available. The installation altitude is 350 m above sea level and the ambient temperature 40 °C. The rated speed of the pump is 740 rpm. The pump unit and motor are located in an unmanned substation, so the winding temperature of the motor must be monitored by PT100 resistance thermometers and evaluated by the converter. The color of the drive converter cabinet units is to be RAL 3002.

Solution:

A 315 kW, 690 V version A drive converter cabinet unit must be selected with the following options:

L26 Main control switch including fuses resp. circuit-breaker

L13 (line contactor),

L86 (PT100 evaluation unit) and

Y09 (special cabinet paint coating).

The relevant ordering data are:

6SL3710-1GH33-3AA0-Z
+**L26** +**L13** +**L86** +**Y09**
Cabinet color RAL 3002

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

Description of options

For more detailed descriptions of options, please refer to the Engineering Manual SINAMICS Low Voltage. The engineering manual is stored on the CD-ROM included with the catalog.

B00, B02, B03

Options in accordance with NAMUR requirements

Exclusion list to other options:

The following limitations and exclusion resulting from the use of **B00** NAMUR terminal block must be observed with regard to other available options.

Not permissible with option	Reason
L45, L57, L59, L60	An EMERGENCY OFF of Category 0 is already included in the NAMUR version. The forced line disconnection is accessed at terminals -A1-X2: 17, 18.
L83, L84	Option B00 already provides a thermistor motor protection unit (shutdown) as standard.
L19	A combination of options L19 and B00 is available on request.
L87	The insulation monitor monitors the complete network which is electrically connected. An insulation monitor must therefore be provided on the plant side.

With options such as **L50, L55, L86**, the connection is as described in the standard. There is no wiring to the NAMUR terminal block.

Attention: Option **B00** must be ordered with supply disconnection option **L13** for currents of < 800 A (parallel circuit: < 1500 A) or option **L26** for currents of > 800 A (parallel circuit: ≥ 1500 A).

B00

NAMUR terminal block

The terminal block has been configured in accordance with the requirements and guidelines of the Standards Working Group for Instrumentation and Control in the Chemicals Industry (NAMUR Recommendation NE37), i.e. certain functions of the device are assigned to specified terminals.

The terminal block and the associated functions are reduced to a required amount. In comparison to the NAMUR recommendation, optional terminals are not listed.

Terminal -A1-X2:	Meaning	Preassignment	Comments
10	DI	ON (dynamic)/ ON/OFF (static)	The effective mode can be coded using a wire jumper on the terminal -A1-400:9; 10.
11	DI	OFF (dynamic)	
12	DI	Faster	
13	DI	Slower	
14	DI	RESET	
15	DI	Interlock	
16	DI	Counterclockwise	"0" signal for CW phase sequence "1" signal for CCW phase sequence
17, 18		Line disconnection	EMERGENCY OFF sequence
30, 31		Ready	Relay output (NO contact)
32, 33		Motor rotates	Relay output (NO contact)
34	DO (NO)	Fault	Relay output (changeover contact)
35	DO (COM)		
36	DO (NC)		
50, 51	AI 0/4-20 mA	Speed setpoint	
60, 61	AO 0/4-20 mA	Motor frequency	
62, 63	AO 0/4-20 mA	Motor current	Motor current is default setting; can be reparameterized for other variables

The 24 V supply is provided at the customer end via terminals -A1-X2:1-3 (fused inside the converter with 1 A). It must be ensured that the safety requirements "Protective extra-low voltage, PELV" are complied with.

Terminal -A1-X2:	Meaning
1	M Reference conductor
2	P24 Infeed 24 V DC
3	P24 Outgoing circuit 24 V DC

For temperature monitoring of explosion-proof motors, the option **B00** contains a PTC thermistor with PTB approval. A switch-off is carried out if the limit is exceeded. The associated PTC sensor is connected to terminal -A1-X3:90, 91.

Terminal -A1-X3:	Meaning
90, 91	AI Connection of PTC sensor

In parallel to operation via the NAMUR terminal block, there is also the option to operate the converter via the communications interface provided as standard on the CU320 Control Unit. The PROFIdrive profile "process technology" used in the chemical industry can be selected via macros.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

B02

Safely isolated 24 V power supply (PELV)

If no protective separation for 24 V supply (PELV) is available at the customer end, this option is used to fit a second power supply to guarantee the PELV. (Terminal assignments as for option **B00**, 24 V supply at terminals -A1-X1:1, 2, 3 are omitted.)

Attention: Option **B02** is only possible together with **B00**.

B03

Separate output for external auxiliaries (uncontrolled)

If a motor fan has to be supplied on the plant, for example, option **B03** provides an uncontrolled separate output with a 10 A fuse. As soon as the supply voltage is present at the converter input, a voltage is also present at these terminals. This corresponds to the converter input voltage ($V = V_{\text{line}}$). This must be observed when planning the external fans.

Terminal	Meaning
-A1-X1:	

1, 2, 3, PE Separate output for external auxiliaries

Attention: Option **B03** is only possible together with **B00**.

D02

Customer documentation in DXF format

This option can be used to order documents such as circuit diagrams, terminal diagrams, arrangement diagram and dimensional drawings in DXF format, in order to process them further in CAD systems, for example. They are supplied on the documentation CD in the desired language (standard is English/German, for other languages, see options **D58**, **D60**, **D80**).

D04

Customer documentation in paper format

Device documentation is supplied electronically on CD-ROM as standard. If the customer also requires a hard copy of the documentation and selects option D04, the following documents will be shipped in a folder with the converter:

- Operating instructions
- Circuit diagram
- Terminal diagram
- Layout diagram
- Dimensional drawing
- Spare parts list
- Test certificate

Regardless of whether option D04 is selected, a hard copy of the safety and transportation guidelines, a check list and a registration form is always supplied.

D14

Preliminary copy of customer documentation

If documents such as circuit diagrams, terminal diagrams, arrangement diagrams and dimensional drawings are required in advance for system engineering, advance documentation can be ordered when ordering the converter. These documents are then supplied electronically a few working days after the order has been entered. The plant-specific documentation is supplied to the ordering party via e-mail in the desired language (standard is English/German, for other languages, see options **D58**, **D60**, **D80**). The recipient's e-mail address must be provided when the order is placed. If option **D02** is selected at the same time, the documents are sent out in DXF format, otherwise they are sent in PDF format. In the e-mail, the recipient is also provided with a link for downloading general advance documentation such as Operating Instructions, Manuals and Commissioning Manuals.

D58

Documentation language: English/French

With option **D58**, the documentation will be supplied with the converter in English and French (standard: English/German). When option **D04** is specified in addition, a printed version of the documentation in English and French is also supplied.

D60

Documentation language: English/Spanish

With option **D60**, the documentation will be supplied with the converter in English and Spanish (standard: English/German). When option **D04** is specified in addition, a printed version of the documentation in English and Spanish is also supplied.

D80

Documentation language: English/Italian

With option **D80**, the documentation will be supplied with the converter in English and Italian (standard: English/German). When option **D04** is specified in addition, a printed version of the documentation in English and Italian is also supplied.

E11 to E71

Individual certification of the converter

The individual certification of the converter by the relevant certification body contains the expansions described for option **M66**.

E11 Individual certificate from Germanischer Lloyd (GL)

E21 Individual certificate from Lloyds Register (LR)

E31 Individual certificate from Bureau Veritas (BV)

E51 Individual certificate from Det Norske Veritas (DNV)

E61 Individual certificate from American Bureau of Shipping (ABS)

E71 Individual certificate from Chinese Classification Society (CCS)

Note: A combination of several individual certificates is not provided.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

F03, F71, F75, F77, F97**Converter acceptance in the presence of the customer**

Order code	Description	
F03	Visual inspection	The scope of the acceptance comprises: • Checking the degree of protection • Checking the equipment (components) • Checking the equipment identifier • Checking the clearance and creepage distances • Checking the cables • Checking the customer documentation • Submitting the acceptance report The checks are carried out with the converter deenergized.
F71	Function test of the converter without motor connected	The scope of the acceptance comprises: • Visual inspection as described for option F03 • Checking the power supply • Checking the protection and monitoring equipment (simulation) • Checking the fans • Testing the precharging • Function test without connected motor • Submitting the acceptance report Following the visual inspection in the deenergized state, the converter is connected to the rated voltage. No current flows at the converter output.
F75	Function test of the converter with test bay motor (no load)	The scope of the acceptance comprises: • Visual inspection as described for option F03 • Checking the power supply • Checking the protection and monitoring equipment (simulation) • Checking the fans • Testing the precharging • Function test with test bay motor (no load) • Submitting the acceptance report Following the visual inspection in the deenergized state, the converter is connected to the rated voltage. A small current flows at the converter's output in order to operate the test bay motor (no load).
F77	Insulation test on converter	The scope of the acceptance comprises: • High-voltage test • Measurement of insulation resistance
F97	Customized acceptance (on request)	If acceptances are desired which are not covered by the options F03, F71, F75 or F77, customized acceptances/supplementary tests can be ordered using the order code F97 on request and following technical clarification.

G20**CBC10 Communication Board**

The CBC10 Communication Board is used to interface the CU320 Control Unit and thus the SINAMICS G150 to the CAN (Controller Area Network) protocol. The board's driver software fulfills the standards of the following CANopen specification of the CiA organization (CAN in Automation):

- Communication profiles in accordance with DS 301
- Drive profile in accordance with DSP 402 (in this case Profile Velocity Mode)
- EDS (Electronic Data Sheet) in accordance with DSP 306
- Operating status signaling in accordance with DSP 305

The CBC10 Communication Board plugs into the option slot on the CU320 Control Unit. The CAN interface on the CBC10 has 2 SUB-D connections for input and output.

G33**CBE20 Communication Board**

The CBE20 Communication Board can be used to connect the SINAMICS G150 to a PROFINET IO network via a CU320 Control Unit.

The SINAMICS G150 then assumes the function of a PROFINET IO device and can perform the following functions:

- PROFINET IO device
- 100 Mbit/s full-duplex
- Supports real-time classes of PROFINET IO:
 - RT (Real-Time)
 - IRT (Isochronous Real-Time), minimum send cycle 500 µs
- Connects to controls as a PROFINET IO device using PROFIdrive compliant with Specification V4
- Standard TCP/IP communication for engineering processes using the STARTER commissioning tool
- Integrated 4-port switch with four RJ45 B sockets based on the PROFINET AXIC ERTEC400. The optimum topology (line, star, tree) can therefore be configured without additional external switches.

The CBE20 Communication Board plugs into the option slot on the CU320 Control Unit.

G61**Additional TM31 customer terminal module**

The standard version of the SINAMICS G150 drive converter cabinet units already contains an Interface Module (TM31 Terminal Module). With a second module, the number of available digital inputs/outputs and the number of analog inputs/outputs within the drive system can be expanded.

K50**SMC30 Sensor Module Cabinet-Mounted**

The SMC30 Sensor Module can be used to acquire the actual motor speed. The signals emitted by the rotary pulse encoder are converted here and made available via the DRIVE-CLiQ interface of the closed-loop control for evaluation purposes.

The following encoders are supported by the SMC30:

- TTL encoders
- HTL encoders.

The motor temperature can also be detected using KTY84-130 or PTC thermistors.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

K51

VSM10 Voltage Sensing Module Cabinet-Mounted

The VSM10 Voltage Sensing Module reads the voltage wave-shape at the motor end. This allows the SINAMICS G150 converter to be connected to a permanent-field, encoderless synchronous machine (flying restart function). The VSM10 is wired to the motor terminals in a short-circuit-proof connection in the delivery state.

K82

Terminal interface for "Safe Torque Off" and "Safe STOP 1" safety functions

The terminal module provides control of the safety functions integrated in the devices in a variable wide voltage range from 24 V to 240 V DC/AC and can, therefore, be adapted to the relevant plant conditions.

The integrated safety functions, starting from the Safety Integrated (SI) input terminals of the SINAMICS components (Control Unit, Power Module), satisfy the requirements specified in the Machinery Directive 98/37/EC, EN 60204-1, DIN EN ISO 13849-1 Category 3 (formerly EN 954-1) for Performance Level (PL) d and IEC 61508 SIL2. These are certified by the BGIA.

In combination with option K82, the safety functions comply with Machinery Directive 98/37/EC, EN 60204-1 and DIN EN ISO 13849-1 Category 3 (formerly EN 954-1) for Performance Level (PL) d. Use option K82 to activate the following Safety Integrated functions (terminology according to draft IEC 61800-5-2):

- Safe Torque Off (STO)
- Safe Stop 1 (SS1) (time-controlled)

L00

Line filter (RFI) for use in the first environment in accordance with EN 61800-3, Category C2 (TN/TT systems)

To limit the **emitted interference**, the drive converters are equipped as standard with a radio interference suppression filter that conforms to the limits defined in Category C3. SINAMICS G150 converters equipped with the line filter also meet the limits for use in the first environment (Category C2) as specified in EN 61800-3.

The SINAMICS G150 units comply as standard with the **immunity** requirements defined in EN 61800-3 for the first and second environments.

In conjunction with line reactors, line filters also limit the conducted interference emitted by the Power Modules to the limit values of Category C2 defined in product standard EN 61800-3. Option **L23** must be ordered in addition for converter outputs > 500 kW.

To allow the power cable shield to be connected in conformance with EMC requirements, an additional EMC shield bus (option **M70**) is factory fitted at the converter input and output. A separate order is not required in this case.

L08

Motor reactor

Motor reactors reduce the voltage load on the motor windings by reducing the voltage gradients on the motor terminals generated when the converter is used. At the same time, the capacitive charge/discharge currents that occur at the converter output when long motor cables are used are reduced. The maximum permissible output frequency when a motor reactor is used is 150 Hz.

A motor reactor can be supplied on request for drive converter cabinet units with power units connected in parallel.

Option **L08** is only available with version A and cannot be combined with option **M78** (top cable entry, motor side).

L10

dv/dt filter plus Voltage Peak Limiter

The dv/dt filter plus VPL consists of two components: the dv/dt reactor and the VPL (Voltage Peak Limiter), which limits voltage peaks and returns the energy to the DC link.

The dv/dt filters plus VPL are to be used for motors of the series only if the insulation system is unknown or insufficient. Standard motors of the 1LA5, 1LA6 and 1LA8 series only require them in cases where the motor has not been specially insulated for operation on a converter (see Catalog D 81.1, chapter "Motors operating with frequency converters").

The dv/dt filters plus VPL limit the rate of voltage rise to values of < 500 V/μs and the typical voltage peaks at rated line voltages to the following values (with motor cable lengths of < 150 m):

< 1000 V at $V_{line} < 575$ V

< 1250 V at 660 V < $V_{line} < 690$ V.

Depending on the converter output, option **L10** can be accommodated in the drive converter cabinet unit or an additional cabinet of width 400 mm is required.

Voltage range	Installation of the dv/dt filter plus VPL within the drive converter cabinet unit	Installation of the VPL in an additional cabinet
V	kW	kW
380 ... 480	110 ... 250	315 ... 560
500 ... 600	110 ... 200	250 ... 560
660 ... 690	75 ... 315	400 ... 800

The dv/dt filter plus VPL is available on request for drive converter cabinet units with power units connected in parallel.

Option **L10** cannot be combined with option **M78** (top cable entry, motor side).

Max. connectable motor cable lengths

Maximum cable lengths		
Protolflex EMC 3 Plus ¹⁾	Shielded cable, e.g. Protodur NYCWY	Unshielded cable, e.g. Protodur NYY
m	m	m
Without reactor or filter		
300	300	450
With motor reactor (option L08)		
300	300	450
With dv/dt filter plus VPL (option L10)		
300	300	450

Longer cable lengths for specific configurations are available on request.

¹⁾ Protolflex EMC 3 Plus cables comply with the limits for interference voltage and emitted noise specified in standard EN 61800-3 for use in the second environment. The limits in standard EN 61800-3 correspond to those in standard EN 55011 Class A Group 2.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

Minimum motor cable lengths for operation with power units connected in parallel

Minimum motor cable lengths must be adhered to in the case of

- a 12-pulse supply and
- a motor with a winding system and
- no motor reactor (option L08) used.

Type rating	SINAMICS G150 drive converter cabinet unit, version A	Minimum cable length
kW	Type 6SL3710-...	m
380 ... 480 V 3 AC		
630	-2GE41-1AA0	13
710	-2GE41-4AA0	10
900	-2GE41-6AA0	9
500 ... 600 V 3 AC		
630	-2GF38-6AA0	18
710	-2GF41-1AA0	15
1000	-2GF41-4AA0	13
660 ... 690 V 3 AC		
1000	-2GH41-1AA0	20
1350	-2GH41-4AA0	18
1500	-2GH41-5AA0	15

L13

Line contactor (for currents ≤ 800 A with single circuit or < 1500 A with a parallel circuit)

The SINAMICS G150 drive converter cabinet units are provided as standard without a line contactor. Option **L13** is needed if a switching element is required for disconnecting the cabinet from the supply (required for EMERGENCY OFF). The contactor is energized and powered inside the converter. For units with rated input currents > 800 A in a single circuit or ≥ 1500 A in a parallel circuit, the function of option **L13** is performed by option **L26**.

Note: Option **L13** is mandatory for converters with parallel-connected power units and a rated input current < 1500 A.

Terminal	Meaning
-X50:	
4	Checkback contact (NO contact) contactor closed
5	Checkback contact (NC contact) contactor closed
6	Root

L15

Sine-wave filter

Sine-wave filters are available in the voltage range from 380 V to 480 V up to 250 kW and in the voltage range from 500 V to 600 V up to 132 kW.

The sine-wave filter at the converter output delivers practically sinusoidal voltages on the motor so that standard motors can be used without special cables and without derating. Standard cables can be used. The maximum permitted motor incoming cable length is 300 m.

Note: The pulse frequency of the converter must be increased when used in conjunction with option **L15**. This reduces the power available at the converter output (derating factor approx. 0.88 %). The control factor of the output voltage returns to approximately 85 % (380 V to 480 V) or 81 % (500 V to 600 V). The maximum output frequency is 150 Hz. It should be noted that the reduced voltage at the motor terminals compared to the rated motor voltage means that the motor switches to field weakening mode earlier.

L19

Connection for external auxiliary equipment

An outgoing circuit fused at max. 10 A for external auxiliary equipment (for example, separately driven motor fan).

The voltage is tapped at the converter input and, therefore, has the same level as the supply voltage.

The outgoing circuit can be controlled internally by the converter or externally.

Terminal	Meaning	Range
-X155:		
1	L1	380 ... 690 V AC
2	L2	380 ... 690 V AC
3	L3	380 ... 690 V AC
11	Contactor control	230 V AC
12	Contactor control	230 V AC
13	Circuit-breaker checkback	230 V AC/0.5 A; 24 V DC /2 A
14	Circuit-breaker checkback	230 V AC/0.5 A; 24 V DC /2 A
15	Contactor checkback	230 V AC/6 A
16	Contactor checkback	230 V AC/6 A
PE	PE	

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

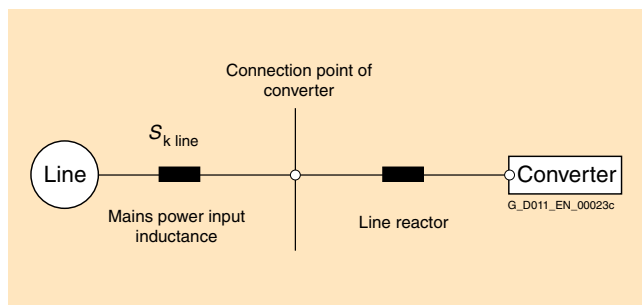
L22/L23

**Delivery without line reactor (L22 for converters ≤ 500 kW)
With line reactor 2 % (L23 for converters in single circuit > 500 kW)**

The line reactor is included in the converter as standard for converters up to 500 kW and for those with power units connected in parallel. The line reactor ($V_k = 2\%$) is optional for converter outputs ≥ 500 kW, because converters in this power range are often connected to the medium-voltage network using transformers adapted to the converter output.

A line reactor is needed for high short-circuit power levels, partly to protect the actual converter against excessive harmonic currents, and thus against overload, and partly to limit line harmonics to the permitted values. The harmonic currents are limited by the complete inductance comprising the line reactor and mains supply cable inductance. Line reactors can be omitted if the mains supply cable inductance is increased sufficiently, i. e., the value of RSC must be sufficiently small.

RSC = Relative Short-Circuit power: Ratio of short-circuit power $S_{k \text{ line}}$ at the line connection point to fundamental apparent output S_{conv} of the connected converters (in accordance with EN 50178/VDE 0160).

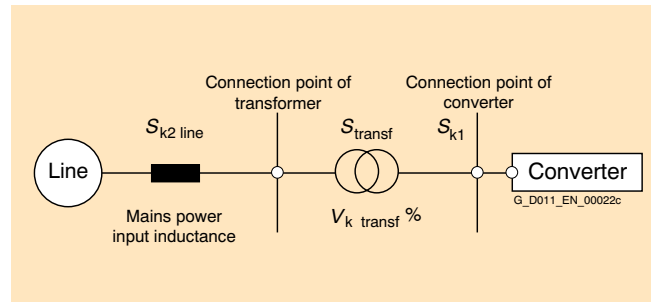


For SINAMICS G150 drive converter cabinet units:

Type rating	Line reactor can be omitted		Line reactor required	
kW	for RSC	Order code (option)	for RSC	Order code (option)
< 200	≤ 43	L22	> 43	-
200 ... 500	≤ 33	L22	> 33	-
≥ 500	≤ 20	-	> 20	L23

As, in practice, it is not known on which supply configuration individual converters are to be operated, i. e., which supply short-circuit power is present at the converter connection point, it is recommended that a line reactor is connected on the line side of the converter.

The line reactor can be omitted (option **L22**) only if the values for RSC are lower than those shown in the table. This is the case when, as shown in the following figure, the converter is connected to the line through a transformer with the appropriate rating.



As high-output converters are usually connected to medium-voltage networks using transformers because of the harmonic effects on the supply, cabinet units in a single circuit with outputs over 500 kW have no line reactors as standard.

A line reactor (**L23** option) is always required, however, if

- for cabinet units > 500 kW, the RSC ratio is > 20 , or
- a line filter is used.

L26

Main switch incl. fuses/circuit-breakers

A switch disconnecter with fuses is available as the main switch for converters in a single circuit with ratings up to 800 A. Cabinets with an output current greater than 800 A use a circuit-breaker instead of a switch disconnecter. The circuit-breaker is controlled and supplied within the converter.

Option **L26** is mandatory for converters with parallel-connected power units and a rated input current of ≥ 1500 A. Circuit-breakers are fitted in these units. For parallel-connected converters with rated input currents of < 1500 A, option **L26** can be selected to equip them with fused main switches in addition to the obligatory line contactors (option **L13**).

L45

EMERGENCY OFF pushbutton, door mounted

The EMERGENCY OFF button with protective collar is fitted in the converter cabinet door and its contacts are connected to the terminal block. The EMERGENCY OFF functions of Category 0 or 1 can be activated in conjunction with options **L57**, **L59** and **L60**.

Attention: By pressing the EMERGENCY OFF button, the motor is stopped either uncontrolled or controlled depending on the selected Category 0 or 1, and the main voltage disconnected from the motor in accordance with IEC 60204-1 (VDE 0113). Auxiliary voltages (e.g. for separately-driven fans or anti-condensation heating) may still be present. Certain areas within the converter also remain under voltage, e.g. the control function or auxiliaries. If complete disconnection of all voltages is required, the EMERGENCY OFF button must be incorporated into a protection function to be provided on the plantside. An NC contact is available at terminal -X120 for this purpose.

The EMERGENCY OFF button is preconfigured at the factory only when one of the options **L57** to **L60** is selected simultaneously. Other circuit arrangements must be implemented on the plant side.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

L50

Cabinet light with service socket

One universal lamp with an integrated service socket is installed for each cabinet panel.

The power supply (on terminal block -X390) for the cabinet light and socket must be provided externally and fused at max. 10 A. The cabinet light is switched on manually via a switch or automatically by an integrated motion detector. The mode is switch-selected.

The power supply to the anti-condensation heating (110 V AC to 230 V, at terminal block -X390) must be provided externally and fused at max. 16 A.

Terminal -X390:	Meaning
1	L1 (230 V AC)
2	N
3	PE

L55

Anti-condensation heating for cabinet

The anti-condensation heating is recommended at low ambient temperatures and high levels of humidity to prevent condensation forming. A 100 W cabinet heating unit is installed in each cabinet element (two heating units are installed in each cabinet with cabinet element widths of 800 mm to 1200 mm).

The power supply to the anti-condensation heating (110 V to 230 V AC, at terminal block -X240) must be provided externally and fused at max. 16 A.

Terminal -X240:	Meaning
1	L1 (110 V ... 230 V AC)
2	N
3	PE

L57

EMERGENCY OFF Category 0, 230 V AC or 24 V DC

EMERGENCY OFF Category 0 for uncontrolled stop in accordance with EN 60204-1.

The function includes voltage disconnection of the converter via the line contactor with bypassing the microprocessor controller by means of a safety combination in accordance with EN 60204-1. The motor coasts in the process. When delivered, the button circuit is preset to 230 V AC. Jumpers must be set when using 24 V DC.

Attention: Option **L57** always assumes that the converter can be electrically isolated from the supply; i.e. option **L13** for units in a single circuit with converter currents ≤ 800 A and option **L26** for converter currents > 800 A.

Irrespective of whether option **L57** is selected, converters with parallel-connected power units must always be equipped with **L13** (for converter currents < 1500 A) or **L26** (for converter currents ≥ 1500 A).

Terminal -X120:	Meaning
7	Looping in the EMERGENCY OFF button from plant side; remove jumper 7-8!
8	Looping in the EMERGENCY OFF button from plant side; remove jumper 7-8!
15	"On" for monitored start; remove jumper 15-16!
16	"On" for monitored start; remove jumper 15-16!
17	Checkback "Triggering safety combination"
18	Checkback "Triggering safety combination"

L59

EMERGENCY STOP Category 1, 230 V AC

EMERGENCY STOP Category 1 for controlled stop in accordance with EN 60204.

The function includes rapid shutdown of the drive via fast stop using a ramp-down ramp to be parameterized by the user. This is followed by voltage disconnection as described in EMERGENCY OFF Category 0.

A braking unit may be necessary to achieve the required shutdown times.

Attention: Option **L59** always assumes that the converter can be electrically isolated from the supply; i.e. option **L13** for units in a single circuit with converter currents ≤ 800 A and option **L26** for converter currents > 800 A. Irrespective of whether option **L59** is selected, converters with parallel-connected power units must always be equipped with **L13** (for converter currents < 1500 A) or **L26** (for converter currents ≥ 1500 A).

Terminal -X120:	Meaning
7	Looping in the EMERGENCY OFF button from plant side; remove jumper 7-8!
8	Looping in the EMERGENCY OFF button from plant side; remove jumper 7-8!
15	"On" for manual start; remove jumper 15-16!
16	"On" for manual start; remove jumper 15-16!
17	Checkback "Triggering safety combination"
18	Checkback "Triggering safety combination"

L60

EMERGENCY STOP Category 1, 24 V DC

EMERGENCY STOP Category 1 for controlled stop in accordance with EN 60204-1.

The function includes rapid shutdown of the drive via fast stop using a ramp-down ramp to be parameterized by the user. This is followed by voltage disconnection as described in EMERGENCY OFF Category 0.

A braking unit may be necessary to achieve the required shutdown times.

Attention: Option **L60** always assumes that the converter can be electrically isolated from the supply; i.e. option **L13** for units in a single circuit with converter currents ≤ 800 A and option **L26** for converter currents > 800 A. Irrespective of whether option **L60** is selected, converters with parallel-connected power units must always be equipped with **L13** (for converter currents < 1500 A) or **L26** (for converter currents ≥ 1500 A).

Terminal -X120:	Meaning
7	Looping in the EMERGENCY OFF button from plant side; remove jumper 7-8!
8	Looping in the EMERGENCY OFF button from plant side; remove jumper 7-8!
15	"On" for manual start; remove jumper 15-16!
16	"On" for manual start; remove jumper 15-16!
17	Checkback "Triggering safety combination"
18	Checkback "Triggering safety combination"

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

L61, L62 Braking units

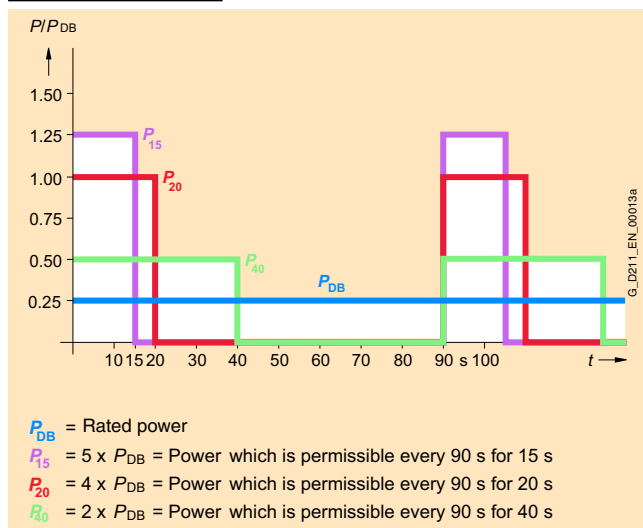
It may be necessary to use braking units for drives that allow regenerative braking.

The braking unit comprises two components: a Braking Module fitted in the converter cabinet and a braking resistor, which must be provided externally (IP20 degree of protection). The braking unit functions as an autonomous unit, and does not require an external power supply. During the braking process, the kinetic energy is converted into heat in the externally installed braking resistor. A max. cable length of 100 m is permissible between the Braking Module and the braking resistor. It is therefore possible to release the heat outside the converter room.

The braking resistor is connected to terminal block –X5 on the drive converter cabinet unit:

Terminal -X5:	Meaning
1	Connection of braking resistor
2	Connection of braking resistor

Characteristic curves



Load diagram for Braking Modules and braking resistors

For information about possible braking unit load cycles and more detailed planning instructions, please refer to the Engineering Manual SINAMICS Low Voltage. The engineering manual is stored as a PDF file on the CD-ROM included with the catalog.

The following braking units are available for the SINAMICS G150 converters and must be selected according to the converter rating:

Option	SINAMICS G150 converter cabinet units	Braking Module				Braking resistance R_B
		Rated power (continu- ous braking power) P_{DB}	Power P_{40}	Power P_{20}	Peak power P_{15}	
	kW	kW	kW	kW	kW	ohm
380 ... 480 V 3 AC						
L61	110 ... 132	25	50	100	125	4.4 ±7.5 %
L62	160 ... 900	50	100	200	250	2.2 ±7.5 %
500 ... 600 V 3 AC						
L62	110 ... 1000	50	100	200	250	3.4 ±7.5 %
660 ... 690 V 3 AC						
L61	75 ... 132	25	50	100	125	9.8 ±7.5 %
L62	160 ... 1500	50	100	200	250	4.9 ±7.5 %

Power

P_{DB} Rated power (continuous braking power)

$P_{40} = 2 \times P_{DB}$ 40 s power referred to a braking interval of 90 s

$P_{20} = 4 \times P_{DB}$ 20 s power referred to a braking interval of 90 s

$P_{15} = 5 \times P_{DB}$ 15 s power referred to a braking interval of 90 s

A second 50 kW braking unit can be fitted in converters with parallel-connected power units in order to increase the braking power. In this case, one Braking Module is assigned to each braking resistor. You can order a second braking unit by selecting option **L62** twice.

If greater braking powers are required in addition to the braking units listed here, then braking units may be connected in parallel circuit for greater converter outputs (on request).

L83 Thermistor motor protection unit (alarm)

Thermistor motor protection unit (with PTB approval) for PTC thermistors type A for alarm. The power supply for the thermistor motor protection unit and the evaluation is provided within the converter.

Terminal -F127:	Meaning
T1	Connection of sensor loop
T2	Connection of sensor loop

L84 Thermistor motor protection unit (shutdown)

Thermistor motor protection unit (with PTB approval) for PTC thermistors type A for shutdown. The power supply for the thermistor motor protection unit is supplied and the evaluation is provided within the converter.

Terminal -F125:	Meaning
T1	Connection of sensor loop
T2	Connection of sensor loop

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

L86

PT100 evaluation unit

The PT100 evaluation unit can monitor up to 6 sensors. The sensors can be connected in a two-wire or three-wire system. The limit values can be programmed by the user for each channel.

In the factory setting, the measurement channels are divided into two groups of three channels. With motors, for example, three PT100 units can, therefore, be monitored in the stator windings and two PT100 units in the motor bearings. Channels that are not used can be suppressed using appropriate parameter settings.

The output relays are integrated into the internal fault and shutdown sequence of the converter. The customer can also tap the event logs via two free fault signal relays. Two user-programmable analog outputs (0/4 mA to 20 mA or 0/2 V to 10 V) are also available for integration in a higher-level controller.

Terminal -A1-A140:	Meaning
T11 to T13	PT100; sensor 1; group 1
T21 to T23	PT100; sensor 2; group 1
T31 to T33	PT100; sensor 3; group 1
T41 to T43	PT100; sensor 1; group 2
T51 to T53	PT100; sensor 2; group 2
T61 to T63	PT100; sensor 3; group 2
51, 52, 54	Relay output Limit for group 1 reached; (changeover contact)
61, 62, 64	Relay output Limit for group 2 reached; (changeover contact)
Ground (OUT 1)	Analog output OUT 1; Group 1 sensors
U1 (OUT 1)	Analog output OUT 1; Group 1 sensors
I1 (OUT 1)	Analog output OUT 1; Group 1 sensors
Ground (OUT 2)	Analog output OUT 2; Group 2 sensors
U2 (OUT 2)	Analog output OUT 2; Group 2 sensors
I2 (OUT 2)	Analog output OUT 2; Group 2 sensors

The sensors can be connected to the PT100 evaluation unit using a two-wire or three-wire system.

The inputs Tx1 and Tx3 must be used for a two-wire system. With a three-wire system, input Tx2 must also be connected (x = 1, 2, ..., 6)

L87

Insulation monitoring

An insulation monitor must be used if the converter is operated on an isolated network. This device monitors the complete electrically connected circuit for insulation faults.

An alarm is output in the event of a fault.

Attention: Only **one** insulation monitor can be used in an electrically connected network.

Since the response philosophy when a ground fault occurs in the insulated network can be different, the output relays are available for integration into a control system on the plant side. It is also possible to integrate the outputs into the converter monitoring on the plant side.

Terminal -A1-A101:	Meaning
11	Signaling relay ALARM 1
12	Signaling relay ALARM 1
14	Signaling relay ALARM 1
21	Signaling relay ALARM 2
22	Signaling relay ALARM 2
24	Signaling relay ALARM 2
M+	External kΩ display 0 μA ... 400 μA
M-	External kΩ display 0 μA ... 400 μA
R1	External reset button (NC contact or wire jumper otherwise the fault code is not stored)
R2	External reset button (NC contact or wire jumper)
T1	External test button
T2	External test button

Insulation monitoring can be supplied on request for drive converter cabinet units with power units connected in parallel.

M06

Base 100 mm high, RAL 7022

The additional cabinet base allows larger bending radii for cables (inlet from below) and the routing of them within the cabinet base.

The cabinet base is always colored RAL 7022. A special color is not possible. It is delivered completely fitted with the cabinet. The height of the operator panel changes accordingly.

M07

Cable plinth 200 mm high, RAL 7035

The cable wiring compartment is made of stable sheet steel and increases the flexibility for the cable connection (inlet from below) and allows routing of cables within the wiring compartment. It is delivered completely fitted with the cabinet. The height of the operator panel changes accordingly.

Attention: The cable wiring compartment is colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the cable wiring compartment is also painted in this color.

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

M13

Top cable entry, line side

The control cabinet is provided with an additional hood in the case of a line connection from above. This hood contains the terminal links for the power cables as well as the cable clamping rail for mechanical support of the cables, an EMC shield bus and a PE rail.

The cabinet height is increased by 405 mm. The rails for the connection from above are delivered completely fitted. For transport reasons, the hoods are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, these must be removed on site in order to fit the hoods. Use of cable braces should be considered in the case of small crane hook heights.

A non-drilled mounting plate made of aluminum (5 mm thick) should be provided on the top of the hood for feeding in the cables. Depending on the number of cables and the cable cross-sections used, holes must be provided in this mounting plate on the plant side for fitting cable glands for introduction of the cables.

Note: The control cables are still connected from below. With option **M13**, the standard line connection from below is not used.

The hoods have IP21 degree of protection. In combination with options **M23**, **M43** and **M54**, additional plastic ventilation grilles and filter pads are provided.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. Ventilation grilles used with IP23, IP43 and IP54 degrees of protection are colored RAL 7035 and cannot be painted.

The covers provided with option **M60** are included in the scope of supply.

Option **M13** cannot be combined with option **L50** (cabinet light with service socket) for drive converter cabinet units with power units connected in parallel.

M21

IP21 Degree of protection

Cabinet version in IP20, but with additional top cover or canopy. The cabinet height is then increased by 250 mm.

For transport reasons, the top covers or canopies are delivered separately and must be fitted on site.

Attention: The top covers or canopies are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the top covers or canopies are also painted this color.

M23/M43/M54

IP23/IP43/IP54 Degrees of protection

When option M23, M43 or M54 is selected, the converter is fitted with a hood. The cabinet height is increased by 400 mm. The covers used with option **M60** are included in the scope of supply. They are a standard part of the cabinet internal air routing and are adapted accordingly.

For transport reasons, the hoods are delivered separately and must be fitted on site.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

M60

Additional touch protection

The drive converter cabinet units are designed as standard in accordance with BGV A3. Option **M60** provides additional covers (outside normal arm's reach) in the vicinity of the AC rails and above the power unit (can only be selected as an option with converters up to 250 kW in the 400 V range, with converters up to 200 kW in the 500 V range and with converters up to 315 kW in the 690 V range, with degrees of protection IP20 and IP21; otherwise supplied as standard).

M66

Marine version

In accordance with the requirements of the classification company:

- Lloyds Register
- American Bureau of Shipping
- Germanischer Lloyd
- Bureau Veritas
- Det Norske Veritas
- Chinese Classification Society

This option includes a strengthened mechanical version of the cabinet, handles (handrail) below the operator panel and mechanical locking of the cabinet doors. The cabinet is provided in the IP23 degree of protection (option **M23**) and includes a cabinet anti-condensation heating (option **L55**). To attach the converter to the bilge, a welding frame (height 5 mm) is supplied separately.

Note: A combination of options **M21**, **M23** and **L55** is not possible. If the converter is used for a safety-relevant drive on the ship, individual certification is necessary (see options **E11** to **E71**).

SINAMICS G150

Drive converter cabinet units

75 kW to 1500 kW

Options (continued)

M70 **EMC shield busbar**

The EMC shield bus is used to connect shielded power cables for line and motor feeder cables. The EMC shield bus is included as standard with option **L00** (RFI suppression filter).

M75 **PE (ground) busbar**

The PE busbar is used to run the PE conductor for the supply and motor infeed cables.

This can be ordered as an option for converters with low power and currents < 700 A. The PE busbar is supplied as standard for output currents > 700 A or groups of cabinets consisting of several cabinet elements.

M78 **Top cable entry, motor side**

The control cabinet is provided with an additional hood in the case of a motor connection from above. Within these hoods, there are the connecting lugs for the power cable and the cable-clamping bar for the mechanical attachment of the cable, an EMC shield bus and a PE busbar.

This cabinet height is increased by 405 mm. The rails for the connection from above are delivered completely fitted. For transport reasons, the hoods are delivered separately and must be fitted on site. Crane transport assemblies (option **M90**) can still be used. However, these must be removed on site in order to fit the hoods. Use of cable braces should be considered in the case of small crane hook heights.

A non-drilled mounting plate made of aluminum (5 mm thick) is provided on the top of the hood for feeding in the cables. Depending on the number of cables and the cable cross-sections used, holes must be provided in this mounting plate on the plant side for fitting cable glands for introduction of the cables.

Note: The control cables are still connected from below. With option **M78**, the standard motor connection from below is not used. A combination of motor-side options **L08**, **L10** and **L15** is not possible. If option **L61** or **L62** is selected at the same time as option **M78**, the braking resistor should also be connected from above.

The hoods have IP21 degree of protection. In combination with options **M23**, **M43** and **M54**, additional plastic ventilation grilles and filter pads are provided.

Attention: The hoods are colored RAL 7035 as standard. If a special color is requested for the cabinet (order code **Y09**), the hoods are also painted in this color. Ventilation grilles used with IP23, IP43 and IP54 degrees of protection are colored RAL 7035 and cannot be painted.

The covers provided with option **M60** are included in the scope of delivery.

M90 **Crane transport assembly (top-mounted)**

In the case of single cabinets up to a width of 600 mm, the crane transport assembly has transport eye bolts. With a cabinet width of 800 mm or more, transport rails are used.

Y09 **Special cabinet paint finish**

The drive converter cabinet units are colored RAL 7035 as standard. The special color must be specified in plain text when ordering. All RAL colors can be selected which are available as powder coatings. If options such as cable wiring compartment (order code **M07**), top covers or canopies (order code **M21**), hoods (order codes **M23/M43/M54**) or cable connection from above (order codes **M13/M78**) are required for the drive converter cabinet units, these are provided in the ordered cabinet color. The molded plastic parts (e.g. ventilation grilles) are colored RAL 7035 and cannot be painted.

SINAMICS G150

Drive converter cabinet units

Line-side power components Line harmonics filters

Overview



Line harmonics filters reduce the converter's low-frequency harmonic effects to a level that can otherwise only be achieved using 12-pulse rectifiers.

They render the converter compliant with every stringent limit value specified in standard IEEE 519-1992.

Design

Line harmonics filters are supplied as stand-alone components in a rugged housing. They are installed between the customer-end low-voltage distribution unit and the converter. The voltage is disconnected and fused in the customer-end low-voltage switchgear, as is the power supply cable.

The line harmonics filters are connected without fans (natural convection). This means that no auxiliary power supply is required.

The line harmonics filters are equipped with a floating thermostatic switch, which can be monitored externally, for the purpose of monitoring thermal overloads (as a result of insufficient cooling air being fed in, for example).

Note: The converter must have a line reactor in order to use a line harmonics filter.

Selection and ordering data

Suitable for drive converter cabinet unit	Type rating at 400 V, 500 V or 690 V kW	Line harmonics filters Order No.
380 ... 480 V 3 AC		
6SL3310-1GE33-1A0	160	6SL3000-OJE36-1AA0
6SL3710-1GE33-8A0	200	
6SL3710-1GE35-0A0	250	
6SL3710-1GE36-1A0	315	
6SL3710-1GE37-5A0	400	6SL3000-OJE38-4AA0
6SL3710-1GE38-4A0	450	
6SL3710-1GE41-0A0	560	6SL3000-OJE41-0AA0
500 ... 600 V 3 AC		
6SL3310-1GF31-8A0	110	6SL3000-OJH33-3AA0
6SL3710-1GF32-2A0	132	
6SL3710-1GF32-6A0	160	
6SL3710-1GF33-3A0	200	
6SL3710-1GF34-1A0	250	6SL3000-OJH34-7AA0
6SL3710-1GF34-7A0	315	
6SL3710-1GF35-8A0	400	6SL3000-OJH35-8AA0
6SL3710-1GF37-4A0	500	6SL3000-OJH38-1AA0
6SL3710-1GF38-1A0	560	
660 ... 690 V 3 AC		
6SL3310-1GH31-8A0	160	6SL3000-OJH33-3AA0
6SL3710-1GH32-2A0	200	
6SL3710-1GH32-6A0	250	
6SL3710-1GH33-3A0	315	
6SL3710-1GH34-1A0	400	6SL3000-OJH34-7AA0
6SL3710-1GH34-7A0	450	
6SL3710-1GH35-8A0	560	6SL3000-OJH35-8AA0
6SL3710-1GH37-4A0	710	6SL3000-OJH38-1AA0
6SL3710-1GH38-1A0	800	

SINAMICS G150

Drive converter cabinet units

Line-side power components Line harmonics filters

Technical specifications

Line voltage 380 ... 480 V 3 AC		Line harmonics filter 6SL3000-0JE36-1AA0			6SL3000-0JE38-4AA0	6SL3000-0JE41-0AA0
Rated current ¹⁾	A	500	700	900		
Power loss	kW	1.0	1.5	2.0		
Line/power connection						
Conductor cross-section, max.						
• DIN VDE	mm ²	4 × 240	4 × 240	4 × 240		
PE connection		3 × M12 stud	3 × M12 stud	3 × M12 stud		
Degree of protection		IP21	IP21	IP21		
Dimensions						
• Width	mm	600	800	1000		
• Height	mm	1700	1700	1700		
• Depth	mm	540	540	540		
Weight, approx.	kg	460	600	900		
Paint finish		RAL 7035	RAL 7035	RAL 7035		
Standards		IEEE 519-1992	IEEE 519-1992	IEEE 519-1992		
Approvals		CE	CE	CE		
Suitable for drive converter cabinet unit		6SL3310-1GE33-1■A0 (160 kW) 6SL3710-1GE33-8■A0 (200 kW) 6SL3710-1GE35-0■A0 (250 kW) 6SL3710-1GE36-1■A0 (315 kW)	6SL3710-1GE37-5■A0 (400 kW) 6SL3710-1GE38-4■A0 (450 kW)	6SL3710-1GE41-0■A0 (560 kW)		

Line voltage 500 ... 600 V 3 AC 660 ... 690 V 3 AC		Line harmonics filter			
		6SL3000-0JH33-3AA0	6SL3000-0JH34-7AA0	6SL3000-0JH35-8AA0	6SL3000-0JH38-1AA0
Rated current ¹⁾	A	290	400	520	710
Power loss	kW	0.8	1.0	1.5	2.0
Line/power connection					
Conductor cross-section, max.					
• DIN VDE	mm ²	4 × 240	4 × 240	4 × 240	4 × 240
PE connection		3 × M12 stud	3 × M12 stud	3 × M12 stud	3 × M12 stud
Degree of protection		IP21	IP21	IP21	IP21
Dimensions					
• Width	mm	600	800	1000	1000
• Height	mm	1700	1700	1700	1700
• Depth	mm	540	540	540	540
Weight, approx.	kg	450	600	830	830
Paint finish		RAL 7035	RAL 7035	RAL 7035	RAL 7035
Standards		IEEE 519-1992	IEEE 519-1992	IEEE 519-1992	IEEE 519-1992
Approvals		CE	CE	CE	CE
Suitable for drive converter cabinet unit		6SL3310-1GF31-8■A0 (110 kW) 6SL3710-1GF32-2■A0 (132 kW) 6SL3710-1GF32-6■A0 (160 kW) 6SL3710-1GF33-3■A0 (200 kW) 6SL3310-1GH31-8■A0 (160 kW) 6SL3710-1GH32-2■A0 (200 kW) 6SL3710-1GH32-6■A0 (250 kW) 6SL3710-1GH33-3■A0 (315 kW)	6SL3710-1GF34-1■A0 (250 kW) 6SL3710-1GF34-7■A0 (315 kW) 6SL3710-1GH34-1■A0 (400 kW) 6SL3710-1GH34-7■A0 (450 kW)	6SL3710-1GF35-8■A0 (400 kW) 6SL3710-1GH35-8■A0 (560 kW)	6SL3710-1GF37-4■A0 (500 kW) 6SL3710-1GF38-1■A0 (560 kW) 6SL3710-1GH37-4■A0 (710 kW) 6SL3710-1GH38-1■A0 (800 kW)

¹⁾ The rated current of the line harmonics filters is defined in accordance with the active power. It can therefore be lower than the rated input current of the relevant Power Module.

SINAMICS G150

Drive converter cabinet units

Line-side power components Recommended fuses

Overview

The fuses specified below are the recommended types for protecting the unit on the low-voltage distribution panel. If option **L26** (main switch or circuit-breaker) has been selected, the converter itself will provide semiconductor protection. In this case, a fuse of type 3NA can be used on the low-voltage distribution panel.

If option **L26** has not been selected, we strongly advise use of fuses of type 3NE¹⁾.

Further information about the line contactors, switch disconnectors, fuses and circuit-breakers specified in the tables can be found in Catalogs LV 1 and LV 1 T.

Single circuit

Type rating		SINAMICS G150 converter	Fuse with existing fuse switch disconnector (option L26)			Fuse (with semiconductor protection effect) without fuse switch disconnector		
(at 400 V, 500 V or 690 V)	(at 60 Hz 460 V or 575 V)		Rated current	Frame size in accordance with DIN 43620-1		Rated current	Frame size in accordance with DIN 43620-1	
kW	hp	6SL3710-...	Type	A		Type	A	
380 ... 480 V 3 AC								
110	150	1GE32-1 . A0	3NA3144	250	2	3NE1230-2	315	1
132	200	1GE32-6 . A0	3NA3250	300	2	3NE1331-2	350	2
160	250	1GE33-1 . A0	3NA3254	355	3	3NE1334-2	500	2
200	300	1GE33-8 . A0	3NA3260	400	3	3NE1334-2	500	2
250	400	1GE35-0 . A0	3NA3372	630	3	3NE1436-2	630	3
315	500	1GE36-1 . A0	3NA3475	800	4	3NE1438-2	800	3
400	600	1GE37-5 . A0	3NA3475	800	4	3NE1448-2	850	3
450	600	1GE38-4 . A0	3NA3365	2 x 500	3	3NE1436-2	2 x 630	3
560	800	1GE41-0 . A0	3NA3472	2 x 630	3	3NE1437-2	2 x 710	3
500 ... 600 V 3 AC								
110	150	1GF31-8 . A0	3NA3244-6	250	2	3NE1227-2	250	1
132	200	1GF32-2 . A0	3NA3252-6	315	2	3NE1230-2	315	1
160	250	1GF32-6 . A0	3NA3354-6	355	3	3NE1331-2	350	2
200	300	1GF33-3 . A0	3NA3365-6	500	3	3NE1334-2	500	2
250	400	1GF34-1 . A0	3NA3365-6	500	3	3NE1334-2	500	2
315	450	1GF34-7 . A0	3NA3352-6	2 x 315	3	3NE1435-2	560	3
400	500	1GF35-8 . A0	3NA3354-6	2 x 355	3	3NE1447-2	670	3
500	700	1GF37-4 . A0	3NA3365-6	2 x 500	3	3NE1448-2	850	3
560	800	1GF38-1 . A0	3NA3365-6	2 x 500	3	3NE1334-2	2 x 500	2
660 ... 690 V 3 AC								
75		1GH28-5 . A0	3NA3132-6	125	1	3NE1022-2	125	00
90		1GH31-0 . A0	3NA3132-6	125	1	3NE1022-2	125	00
110		1GH31-2 . A0	3NA3136-6	160	1	3NE1224-2	160	1
132		1GH31-5 . A0	3NA3240-6	200	2	3NE1225-2	200	1
160		1GH31-8 . A0	3NA3244-6	250	2	3NE1227-2	250	1
200		1GH32-2 . A0	3NA3252-6	315	2	3NE1230-2	315	1
250		1GH32-6 . A0	3NA3354-6	355	3	3NE1331-2	350	2
315		1GH33-3 . A0	3NA3365-6	500	3	3NE1334-2	500	2
400		1GH34-1 . A0	3NA3365-6	500	3	3NE1334-2	500	2
450		1GH34-7 . A0	3NA3352-6	2 x 315	3	3NE1435-2	560	3
560		1GH35-8 . A0	3NA3354-6	2 x 355	3	3NE1447-2	670	3
710		1GH37-4 . A0	3NA3365-6	2 x 500	3	3NE1448-2	850	3
800		1GH38-1 . A0	3NA3365-6	2 x 500	3	3NE1334-2	2 x 500	2

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

¹⁾ The combined fuses (3NE1., gS class) for cable and semiconductor protection are recommended to protect the converter. These fuses are specially adapted to the requirements of the semiconductors in the input rectifier.

- Superfast
- Adapted to the limit current integral of the semiconductor
- Low arc voltage
- Improved current limiting (lower let-through values).

SINAMICS G150

Drive converter cabinet units

Line-side power components Recommended fuses

Overview (continued)

Parallel circuit (data per converter subsystem)

Type rating		SINAMICS G150 converter	Fuse with existing fuse switch disconnecter (option L26)			Fuse (with semiconductor protection effect) <u>without</u> fuse switch disconnecter		
(at 400 V, 500 V or 690 V)	(at 60 Hz 460 V or 575 V)			Rated current	Frame size in accordance with DIN 43620-1		Rated current	Frame size in accordance with DIN 43620-1
kW	hp	6SL3710-...	Type	A		Type	A	
380 ... 480 V 3 AC								
630	900	2GE41-1AA0	3NA3475	800	4	3NE1438-2	800	3
710	1200	2GE41-4AA0	3NA3745	800	4	3NE1448-2	850	3
900	1200	2GE41-6AA0	3NA3365	2 × 500	3	3NE1436-2	2 × 630	3
500 ... 600 V 3 AC								
630	900	2GF38-6AA0	3NA3352-6	2 × 315	3	3NE1435-2	560	3
710	1000	2GF41-1AA0	3NA3365-6	2 × 500	3	3NE1447-2	670	3
1000	1600	2GF41-4AA0	3NA3365-6	2 × 500	3	3NE1448-2	850	3
660 ... 690 V 3 AC								
1000		2GH41-1AA0	3NA3354-6	2 × 355	3	3NE1447-2	670	3
1350		2GH41-4AA0	3NA3365-6	2 × 500	3	3NE1448-2	850	3
1500		2GH41-5AA0	3NA3365-6	2 × 500	3	3NE1334-2	2 × 500	2

Note: The type rating data in hp units are based on the NEC/CEC standards for the North American market.

SINAMICS G150

Drive converter cabinet units

Conductor cross-sections and connections

Overview

The tables below show the recommended or maximum possible conductor cross-sections on the line and motor sides.

The recommended cross-sections are based on the listed fuses and single routing of the three-wire cables at an ambient temperature of 40 °C.

When the conditions differ from the above stated (cable routing, cable grouping, ambient temperature), the instructions for routing the cables must be taken into account.

Single circuit

Type rating	Converter SINAMICS G150 Version A	Weight (standard version)	Line connection			Motor connection			Cabinet grounding	
			Recommended cross-section ¹⁾ DIN VDE	Maximum conductor cross-section DIN VDE	Fixing screw M12 (Number of holes)	Recommended cross-section ¹⁾ DIN VDE	Maximum conductor cross-section DIN VDE	Fixing screw M12 (Number of holes)	Fixing screw M12 (Number of holes)	Comment
kW	6SL3710- ...	kg	mm ²	mm ²		mm ²	mm ²			
380 ... 480 V 3 AC										
110	1GE32-1AA0	320	2x70	4x240	(2)	2x50	2x150	(2)	(2)	
132	1GE32-6AA0	320	2x95	4x240	(2)	2x70	2x150	(2)	(2)	
160	1GE33-1AA0	390	2x120	4x240	(2)	2x95	2x150	(2)	(2)	
200	1GE33-8AA0	480	2x120	4x240	(2)	2x95	2x150	(2)	(2)	
250	1GE35-0AA0	480	2x185	4x240	(2)	2x150	2x240	(2)	(2)	
315	1GE36-1AA0	860	2x240	4x240	(2)	2x185	2x240	(2)	(2)	
400	1GE37-5AA0	865	3x185	4x240	(2)	3x150	2x240	(2)	(10)	ground bus
450	1GE38-4AA0	1075	4x150	8x240	(4)	3x185	4x240	(2)	(16)	ground bus
560	1GE41-0AA0	1360	4x185	8x240	(4)	4x185	6x240	(3)	(18)	ground bus
500 ... 600 V 3 AC										
110	1GF31-8AA0	390	120	4x240	(2)	95	2x150	(2)	(2)	
132	1GF32-2AA0	390	2x70	4x240	(2)	120	2x150	(2)	(2)	
160	1GF32-6AA0	390	2x95	4x240	(2)	2x70	2x150	(2)	(2)	
200	1GF33-3AA0	390	2x120	4x240	(2)	2x95	2x240	(2)	(2)	
250	1GF34-1AA0	860	2x185	4x240	(2)	2x120	4x240	(2)	(2)	
315	1GF34-7AA0	860	2x185	4x240	(2)	2x150	4x240	(2)	(2)	
400	1GF35-8AA0	860	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
500	1GF37-4AA0	1320	3x185	8x240	(4)	3x150	6x240	(3)	(18)	ground bus
560	1GF38-1AA0	1360	4x150	8x240	(4)	3x185	6x240	(3)	(18)	ground bus
660 ... 690 V 3 AC										
75	1GH28-5AA0	320	50	4x240	(2)	35	2x70	(2)	(2)	
90	1GH31-0AA0	320	50	4x240	(2)	50	2x150	(2)	(2)	
110	1GH31-2AA0	320	70	4x240	(2)	70	2x150	(2)	(2)	
132	1GH31-5AA0	320	95	4x240	(2)	70	2x150	(2)	(2)	
160	1GH31-8AA0	390	120	4x240	(2)	95	2x150	(2)	(2)	
200	1GH32-2AA0	390	2x70	4x240	(2)	120	2x150	(2)	(2)	
250	1GH32-6AA0	390	2x95	4x240	(2)	2x70	2x185	(2)	(2)	
315	1GH33-3AA0	390	2x120	4x240	(2)	2x95	2x240	(2)	(2)	
400	1GH34-1AA0	860	2x185	4x240	(2)	2x120	4x240	(2)	(2)	
450	1GH34-7AA0	860	2x185	4x240	(2)	2x150	4x240	(2)	(2)	
560	1GH35-8AA0	860	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
710	1GH37-4AA0	1320	3x185	8x240	(4)	3x150	6x240	(3)	(18)	ground bus
800	1GH38-1AA0	1360	4x150	8x240	(4)	3x185	6x240	(3)	(18)	ground bus

¹⁾ The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code) or CEC (Canadian Electrical Code) standards.

SINAMICS G150

Drive converter cabinet units

Conductor cross-sections and connections

Overview (continued)

Single circuit

Type rating	Converter SINAMICS G150 Version C	Weight (standard version)	Line connection			Motor connection			Cabinet grounding	
			Recom- mended cross- section ¹⁾	Maximum conductor cross- section	Fixing screw M12 (Number of holes)	Recom- mended cross- section ¹⁾	Maximum conductor cross- section	Fixing screw M12 (Number of holes)	Fixing screw M12 (Number of holes)	Comment
kW	6SL3710- ...	kg	mm ²	mm ²		mm ²	mm ²			
380 ... 480 V 3 AC										
110	1GE32-1CA0	225	2x70	4x240	(1)	2x50	2x150	(1)	(2)	
132	1GE32-6CA0	225	2x95	4x240	(1)	2x70	2x150	(1)	(2)	
160	1GE33-1CA0	300	2x120	4x240	(1)	2x95	2x150	(1)	(2)	
200	1GE33-8CA0	300	2x120	4x240	(1)	2x95	2x150	(1)	(2)	
250	1GE35-0CA0	670	2x185	4x240	(1)	2x150	2x240	(1)	(2)	
315	1GE36-1CA0	670	2x240	4x240	(4)	2x185	2x240	(4)	(2)	
400	1GE37-5CA0	670	3x185	4x240	(4)	3x150	2x240	(4)	(8)	ground bus
450	1GE38-4CA0	670	4x150	8x240	(4)	3x185	4x240	(4)	(8)	ground bus
560	1GE41-0CA0	980	4x185	8x240	(4)	4x185	6x240	(4)	(10)	ground bus
500 ... 600 V 3 AC										
110	1GF31-8CA0	300	120	4x240	(1)	95	2x150	(1)	(2)	
132	1GF32-2CA0	300	2x70	4x240	(1)	120	2x150	(1)	(2)	
160	1GF32-6CA0	300	2x95	4x240	(1)	2x70	2x150	(1)	(2)	
200	1GF33-3CA0	300	2x120	4x240	(1)	2x95	2x240	(1)	(2)	
250	1GF34-1CA0	670	2x185	4x240	(2)	2x120	4x240	(2)	(2)	
315	1GF34-7CA0	670	2x185	4x240	(2)	2x150	4x240	(2)	(2)	
400	1GF35-8CA0	670	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
450	1GF37-4CA0	940	3x185	8x240	(4)	3x150	6x240	(3)	(18)	ground bus
560	1GF38-1CA0	980	4x150	8x240	(4)	3x185	6x240	(3)	(18)	ground bus
660 ... 690 V 3 AC										
75	1GH28-5CA0	225	50	4x240	(1)	35	2x70	(1)	(2)	
90	1GH31-0CA0	225	50	4x240	(1)	50	2x150	(1)	(2)	
110	1GH31-2CA0	225	70	4x240	(1)	70	2x150	(1)	(2)	
132	1GH31-5CA0	225	95	4x240	(1)	70	2x150	(1)	(2)	
160	1GH31-8CA0	300	120	4x240	(1)	95	2x150	(1)	(2)	
200	1GH32-2CA0	300	2x70	4x240	(1)	120	2x150	(1)	(2)	
250	1GH32-6CA0	300	2x95	4x240	(1)	2x70	2x185	(1)	(2)	
315	1GH33-3CA0	300	2x120	4x240	(1)	2x95	2x240	(1)	(2)	
400	1GH34-1CA0	670	2x185	4x240	(2)	2x120	4x240	(2)	(2)	
450	1GH34-7CA0	670	2x185	4x240	(2)	2x150	4x240	(2)	(2)	
560	1GH35-8CA0	670	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
710	1GH37-4CA0	940	3x185	8x240	(4)	3x150	6x240	(3)	(18)	ground bus
800	1GH38-1CA0	980	4x150	8x240	(4)	3x185	6x240	(3)	(18)	ground bus

¹⁾ The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code) or CEC (Canadian Electrical Code) standards.

SINAMICS G150

Drive converter cabinet units

Conductor cross-sections and connections

Overview (continued)

Parallel circuit

Type rating	Converter SINAMICS G150 Version A	Weight (standard version)	Line connection			Motor connection			Cabinet grounding	
			Recom- mended cross- section ¹⁾	Maximum conductor cross- section	Fixing screw M12 (Number of holes)	Recom- mended cross- section ¹⁾	Maximum conductor cross- section	Fixing screw M12 (Number of holes)	Fixing screw M12 (Number of holes)	Comment
kW	6SL3710- ...	kg	mm ²	mm ²		mm ²	mm ²			
380 ... 480 V 3 AC										
630	2GE41-1AA0	1700	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
710	2GE41-4AA0	1710	3x185	4x240	(2)	3x150	4x240	(2)	(10)	ground bus
900	2GE41-6AA0	2130	4x150	8x240	(4)	3x185	4x240	(2)	(16)	ground bus
500 ... 600 V 3 AC										
630	2GF38-6AA0	1700	2x185	4x240	(2)	2x150	4x240	(2)	(2)	
710	2GF41-1AA0	1700	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
1000	2GF41-4AA0	2620	3x185	8x240	(4)	3x150	6x240	(3)	(18)	ground bus
660 ... 690 V 3 AC										
1000	2GH41-1AA0	1700	2x240	4x240	(2)	2x185	4x240	(2)	(2)	
1350	2GH41-4AA0	2620	3x185	8x240	(4)	3x150	6x240	(3)	(18)	ground bus
1500	2GH41-5AA0	2700	4x150	8x240	(4)	3x185	6x240	(3)	(18)	ground bus

Note: The recommended and maximum conductor cross-sections relate to the appropriate subsystem of the converter connected in parallel circuit.

¹⁾ The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code) or CEC (Canadian Electrical Code) standards.

SINAMICS G150

Drive converter cabinet units

Conductor cross-sections and connections

Overview (continued)

Required cable cross-sections for line and motor connections

It is always advisable to use 3-wire three-phase cables or to connect several cables of this type in parallel. There are two main reasons for this:

- This is the only method by which the high IP55 degree of protection or better can be easily achieved for the motor terminal box because the cables are fed into the terminal box via screwed glands and the number of possible glands is limited by the geometry of the terminal box. Single cables are less suitable.
- With three-phase cables, the total ampere-turns over the cable outer diameter equals zero and they can be routed in (conductive, metal) cable ducts or racks without any noticeable currents (ground current or leakage current) being induced in these conductive, metal connections. The danger of induced leakage currents and thus of increased cable sheath losses is greater for single cables.

The cable cross-section required depends on the current transferred in the cable. The permissible current loading of cables is defined, for example, in DIN VDE 0276-1000. It depends partly on ambient conditions such as temperature and partly on the type of routing. When laid singly, the cables are cooled relatively well. Where there are several cables routed together, they can heat each other up, and thus receive much poorer ventilation. Please note the corresponding derating factors for these supplementary conditions in DIN VDE 0276-1000. With an ambient temperature of 40 °C, the cross-sections of copper cables can be based on the following table.

Current carrying capacity in accordance with DIN VDE 0298 Part 2 at 40 °C

Cross-section of 3-wire cables mm ²	With single routing A	With several cables on a common cable rack A
50	138	95
70	176	121
95	212	146
120	245	169
150	282	194
185	323	222
240	380	261
300	418	289

With higher currents, cables must be connected in parallel.

Note: The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code) or CEC (Canadian Electrical Code) standards.

Grounding

Required PE conductor cross-sections:

The PE conductor must be dimensioned taking into account the following data:

- In the case of a ground fault caused by voltage losses of the ground fault current on the PE conductor, no impermissible high contact voltages may occur (< 50 V AC or < 120 V DC, EN 50178 Section 5.3.2.2, IEC 60364-5-54).
- The PE conductor must not be excessively loaded by any ground fault current it carries.
- If it is possible for continuous currents to flow through the PE conductor when a fault as defined in EN 50178 Section 8.3.3.4 occurs, the PE conductor cross-section must be dimensioned for this continuous current.
- The PE conductor cross-section must be selected in accordance with 60204-1.

Cross-section of outer conductor mm ²	Minimum cross-section of external copper PE conductors mm ²
Up to 16	Minimum cross-section of outer conductor
16 ... 35	16
35 and above	At least half the cross-section of outer conductor

Note: The recommendations for the North American market in AWG or MCM must be taken from the appropriate NEC (National Electrical Code) or CEC (Canadian Electrical Code) standards.

- Switchgear and motors are usually grounded separately via a local ground electrode. With this constellation, the ground fault current flows via the parallel ground connections and is divided. With this grounding system, no impermissible contact voltages can occur, despite the PE conductor cross-sections used in the above table. Based on experience with different grounding configurations, however, we recommend that the ground wire from the motor should be routed directly back to the converter. For EMC reasons and to prevent bearing currents, symmetrical motor cables rather than four-wire cables should be used here. The ground connection (PE) must be routed separately or arranged symmetrically in the motor cable. The symmetry of the PE conductor is achieved using a conductor surrounding all phase conductors or using a cable with a symmetrical arrangement of the three phase conductors and three ground conductors.
- Through their high-speed control, the converters limit the load current (motor and ground fault currents) to an rms value corresponding to the rated current. Because of this, we recommend use of a PE conductor cross-section that is similar to the outer conductor cross-section for grounding the control cabinet.